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Automotive Service and the Farmer

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MOTOR AGE

Volume XXXV
Number 15

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CHICAGO, APRIL 10, 1919

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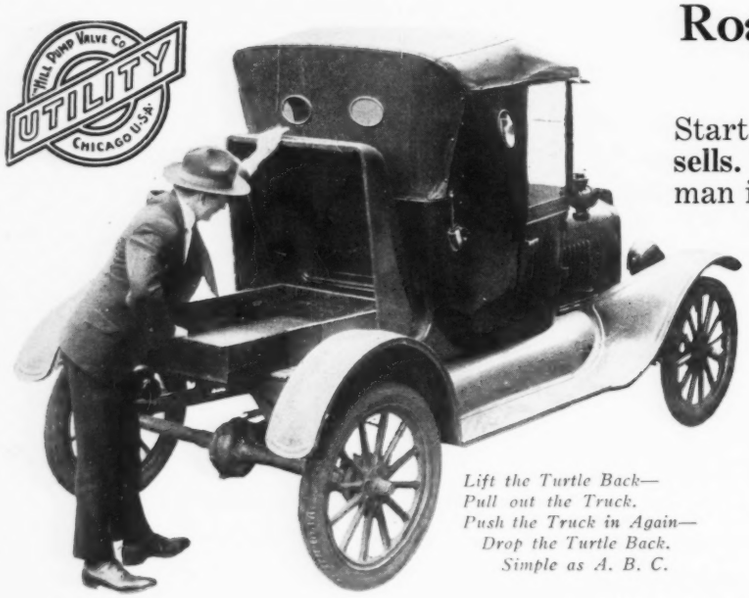

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MOTOR AGE

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MOTOR AGE

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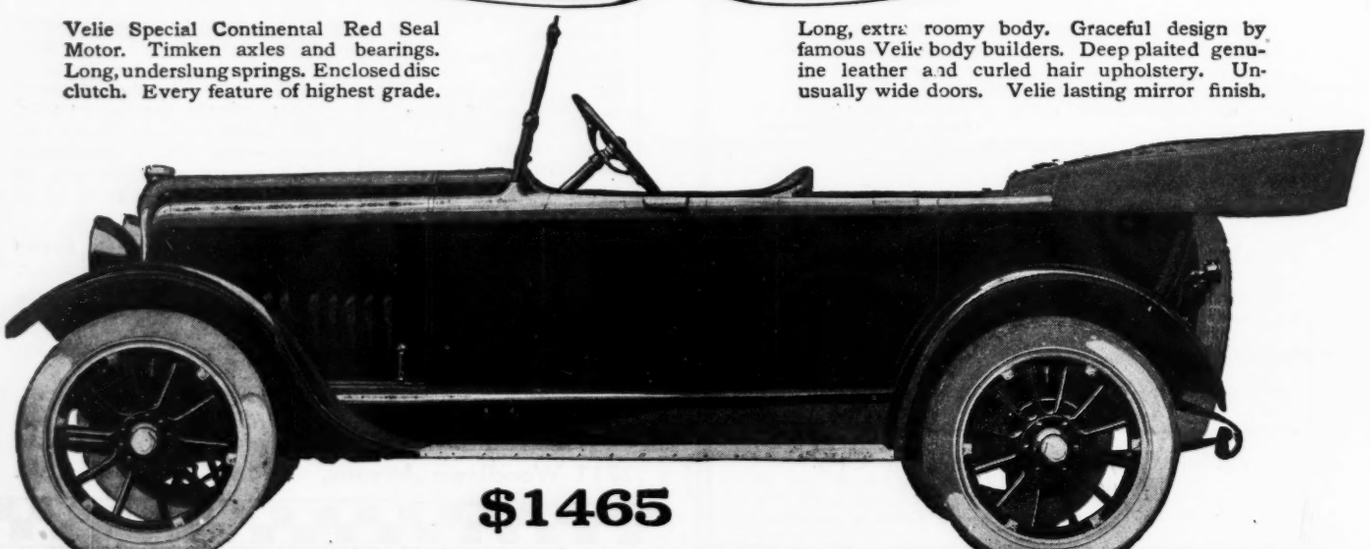

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MOTOR AGE

Preventive service begins when the dealer selects and buys a line of equipment to sell. It means a dealer must educate his customers so they can avoid trouble as far as possible. Many dealers are using schools to help them do this. This shows such a school held by the Rude Auto Co., Perry, Iowa. Incidentally, four tractor sales resulted directly

Automotive Service and the Farmer

It Is NOT ENOUGH for the Dealer to Render Service—He Must Render the RIGHT KIND of Service—Just Why and How Are Told Here

By Fred M. Loomis

Motor Age Editorial Staff

THE problem which stands head and shoulders above all other problems in the sight of the automotive dealer today is the rendering of the right kind of service. This is due to the rapid multiplication of automotive equipment. The car, the truck, the tractor, the motor cultivator, the farm lighting plant and the stationary or portable powerplant—all adaptations of the internal combustion engine, and all requiring service at some time or other, present to the automotive dealer a problem so complicated he is puzzling his brains for a way to solve it acceptably.

The truth is the service problem suddenly has become a thing of tremendous proportions. It is the most important and vital thing the dealer has to meet, because on the way in which he meets it will depend his success or failure in the automotive business. It suddenly has acquired greater importance because of the coming of the tractor, the truck and the farm lighting plant to the farm, and its importance further is emphasized by the fact that the automotive dealer now is called on for service not only on the automotive equipment itself but also on that class of equipment which invariably accompanies automotive equipment.

This all has descended on the shoulders of the automotive dealer. In many instances he is almost literally buried under it. But here and there the situation is being met successfully. Some automotive dealers have risen to the occasion and either are prepared now to meet the utmost demands, or they are getting themselves into a position where they can meet them.

So complicated and diversified has the demand for service become it is impossible to lay down any hard and fast rules. No one may say to this dealer, or to that, do this or do that—but it is possible to indicate the fundamental principles of good service, to specify in a general way what service consists, and then to tell in some detail how this or that dealer who is getting across and making a success of his business, and how he has solved the various service problems as they have presented themselves. The dealer then who is a little uncertain of just what he is going to do can adopt such of the ideas and plans presented as will meet his individual conditions.

In the first place the dealer should have a broad conception of what service really is.

The narrow construction of service is that it is something which has to be done upon automotive equipment—after it has been bought by the farmer—to keep it in repair and working condition. The broader and more enlightened conception of service is comparable to the modern theory of medical treatment—that it is better to use preventive measures than curative measures. In other words, the first duty of the dealer, from the viewpoint of real service, is to sell automotive equipment so perfectly adapted to the locality and its needs, so dependable in its quality and so reliable in operation that trouble will be reduced to the minimum after it has passed into the hands of the buyer. *This broader idea of service makes service begin when the dealer selects and buys a line of equipment to sell.*

This point of view was not so important when the automotive dealer was confined in his activities largely to cars. It began to grow in importance, however, with each addition to the line, until now, with everything automotive from the carpet sweeper in the house to the plow in the field, it is the only viewpoint from which the dealer can get the proper perspective of what he will be called on to do.

Assume the dealer is sufficiently up-to-date to realize this and has had it in mind in the selection of his automotive line. The next phase of the service problem looms before him. This assumes a two-fold aspect. *He must equip himself to meet trouble if it comes, and he must educate his customers so they can anticipate or avoid as far as possible trouble* and thus reduce the service problem, as far as the dealer himself is concerned, to its lowest possible terms.

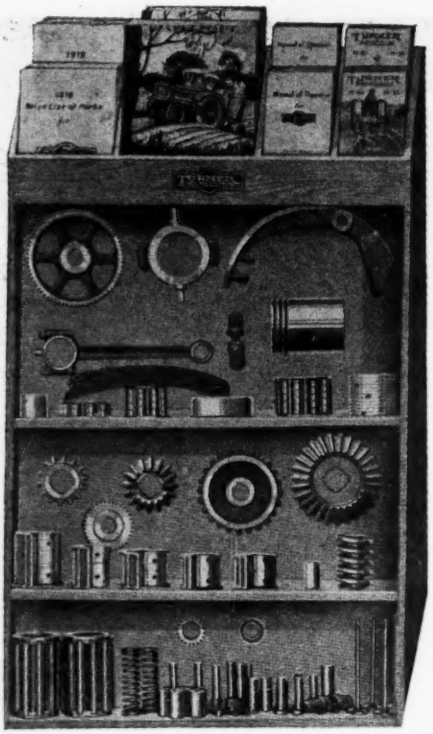
Factors That Determine Service

Consider, first, the education of the customer. Here the dealer fortunately is not entirely dependent on his own initiative or resources. As far as cars are concerned, and only to a lesser degree as far as trucks are concerned, the dealer has learned by experience what he must do. His experience in the sale of cars has taught him, and to tell him here what he ought to do in this department of the automotive business would be a good deal like carrying coals to Newcastle. The car and, to a great extent, the truck can be brought to the garage for treatment when necessary, and the quality of service there will depend primarily on the sort of the equipment in the garage and the skill of the workers. With such parts of the automotive line the education of the user does not loom as so vastly important.

But it is different with the new automotive equipment the dealer is taking on. This service for the most part must be rendered at a distance from the garage—on the farm, in fact. This presents a condition wherein the education of the user to the point where he largely can prevent trouble is important.

The manufacturer of automotive equipment has realized the importance of education and has taken steps to secure it. The plan usually adopted, that of holding schools, accomplishes the two-fold purpose of educating the dealer as well as the farmer. At the beginning, these schools actually were attended mainly by dealers, but lately the scope has been widened and now both dealers and farmers are included.

This has been accomplished by moving the school from the factory and the distributing house to the showroom of the dealer. Such schools, hundreds of them, have been held under the direction of the International Harvester, Emerson-Brantingham, Avery, Fordson and others. How they are conducted and what they accomplish is commonly known to the dealers and details may be omitted here.



Another layout of tractor parts which helps the dealer render adequate service

There has grown out of these a new kind of school destined to have a still more influential effect in the long run than the factory-run schools. These are the schools which are being conducted by the dealers themselves. They follow about the same general plan, so a brief description of one will give some idea of their conduct and value. Take one held recently by the Dunlap Motor Co., Ames, Iowa, as an example.

The Dunlap Motor Co. sold several tractors in its territory during the preceding season. When it was decided to hold the school, the invitations sent out included not only the men who already had bought tractors but every farmer in the vicinity who was considered a prospect, present or future. The attendance the first day was 150. This doubled the second day—all farmers.

Dunlap arranged for men in the automotive and affiliated lines to come to the school and talk. Men expert in mechanics, lubrication, ignition; tractor men, truck men, tire men and accessory men were present. Also, there was brought in from the farm one of the tractors sold the previous season, which had seen hard and continuous service. This tractor was completely dissembled before the spectators. The position of each piece entering into its construction was shown and its function explained. The evidence of wear, if there were any such, were indicated as emphasizing the importance of proper care and lubrication.

The talks, as far as possible, as well as explanations incident to the tearing down and exposition of the tractor, were put into language so simple and direct that even the farmers' boys present could understand. The purpose was to show the farmers just what sort of a piece of mechanism they had when they owned a tractor, how it was built, how it worked, just what sort of trouble they might encounter, where that trouble would be most likely to occur and the cause.

Also it was pointed out how much of the trouble common to tractor operation might be anticipated and prevented by removing the causes for trouble and by giving the tractor the care and consideration to which it was entitled. All this was done simply, logically and intelligently. The farmers were invited to examine for themselves and to ask questions about anything they did not clearly understand.

Such schools are being held by the score all over the country, and they are accomplishing incalculable good in instructing the farmer about the mechanical construction of the automotive equipment he already owns or which he is about to own. They will reduce materially the amount of subsequent service the dealers holding such schools have to render on the equipment they sell. This because such dealers will have taken the pains in advance to show the farmer how to take care of his equipment and why he must, and, also, by enlarging his mechanical knowledge, they have taught him to recognize trouble if it comes and to attend to the least serious of it himself. *This is giving real service to the farmer in so far as it is forewarning and forearming him so that he can avoid the necessity for service.*

Equipment Must Supplement Education

But educating the owner of automotive equipment, no matter how well and thoroughly that may be done, is not enough. Both the manufacturer and the dealer know there will be trouble despite all they can do and that appeals for help are inevitable in the automotive business. How, then, best prepare to meet the inevitable? Manifestly, by having within reach the equipment to take care of the trouble when it does come.

Equipment is of little or no value unless there be men who know how to use it and who have the necessary skill to use it efficiently. Thus it becomes necessary to train men for service emergencies. The providing of enough men, now that automotive equipment has become so common on the farms, is a matter beyond the ability of the factory or the wholesale distributer to compass. It is distinctively a problem for the dealer to solve. He must solve it as a matter of self-protection no less than as a matter of good business policy. *He must have competent mechanics in his employ. Such men must be trained.* Here again the manufacturer is coming to the assistance of the dealer.

For instance, International Harvester has inaugurated a series of mechanical schools at its branch houses at which service men are given the requisite training. The plan is briefly as follows:

The blockman in the territory, wherever the company has a tractor sales contract, for instance, selects some man, preferably a man with some mechanical experience, but at any rate a man who show mechanical aptitude and who manifests a desire to improve himself. This man may be an employee of the dealer who sells the I. H. C. machines, or he may be a man who operates, or expects to operate, an independent repair-

shop. The men thus selected, at their own expense, gather at the branch house of the company and there they receive thorough instruction in the construction, operation, care and repair of tractors. At the conclusion of the course they go back to their respective towns skilled and able to cope with any difficulty likely to arise in connection with any of the automotive equipment in use in that vicinity.

This too is real service, because it means that in every town from which automotive equipment is sold there shall be available a competent man who can give instant one-day service and who can insure that most desirable of all things in service—the continuous and efficient operation of automotive machines.

The International Harvester is not alone in this. Wallis, Turner and other manufacturers are doing the same thing. The result of this policy has great interest for the dealer, as it assures him the services of competent men to run his service department and thus enables him to give *the right kind of service at the right time to his customers.*

The most individual phase of this service question, as concerns the dealer himself, is what he has, or must have, in the way of equipment. This naturally divides itself into three parts: The shop and equipment; the stock of repair parts; the means he has for carrying his service to the job, or for bringing the automotive equipment from the job to the shop.

Shop Equipment Shows Growth Also

Most automotive dealers have some sort of a shop and shop equipment. The cars they sold necessitated this. Of course these shops are of all kinds, from an obscure corner in the garage to an entire building devoted to shop purposes. The equipment, too, varies through quite as wide a range. From a mere workbench with a few inefficient tools to a thoroughly equipped and organized shop with lathe, drill, reboring machine, engine and rear axle stands, burning-in stand and vulcanizing equipment is a wide jump, but it not infrequently happens that it is a jump which may be taken in even a relatively small town.

Since the tractor made its appearance, however, and now that the truck is taking on business importance in so large a portion of the country, the tendency among automotive dealers is to increase their shop facilities and to add more modern and efficient equipment. The very diversity of the demands made on them for service has made this a necessary development. Dealers who heretofore have not found it expedient thoroughly to equip themselves with a shop, now find the emergency of necessary expansion facing them and are rising to it.

There is neither intention nor need here to go into detail as to what the modern repairshop should be. The fact that progressive development of both shops and equipment is apparent is sufficient indication that such car dealers as have become automotive dealers realize the necessity for better shops and equipment to give the better service demanded of them.

Another marked tendency in the automotive trade is the enlargement and greater specialization of the parts and accessory departments. In many instances these departments are being segregated from the remainder of the business and given the dignity of a separate manager and real business administration.

Enlargement of the parts department naturally follows the taking on of tractors, trucks and other automotive equipment. This is particularly important as regards tractor parts. In this connection, too, the tractor manufacturers are making special inducements and concessions to encourage the automotive dealer to stock and carry a supply of parts commensurate with the importance of the tractor business to him, measured by the number of tractors there may be in use in his locality.

As an instance of this is the recent announcement by Emerson-Brantingham it will give an additional 10 per cent discount on repair parts to the dealer who will stock an adequate supply and at the end of the season parts on hand unsold will be exchanged for an equivalent value of up-to-date parts. Also such concerns as Turner and Hart-Parr are making up assortments of tractor parts, inclosed in a case which serves the dealer not only as a convenient place in which to keep them but also as a display case for whatever advertising value it may have. Sometimes the carrying of a stock of repairs is made obligatory upon the dealer, sometimes not.

Automotive dealers, who have gone into the business enthusiastically and determined to stick, of their own volition are stocking repair parts for tractors and trucks. Such organizations as the Rude Auto Co., with headquarters at Cedar Rapids, Iowa, for instance, and the Swaney Motor Co., with headquarters at Carroll, Iowa, carry large stocks of tractor repairs at some central point in the territories they control, and smaller stocks, easily replenished from the central stock, at their various branches. Some of these stocks run into a good many hundreds of dollars.

Again, this is in line with the modern idea of giving adequate and complete service, because with ample stocks of repairs immediately available, the owner of equipment is insured against that aggravating and costly waiting for repairs from which he so often suffered under the old regime. It means, in effect, a one-day service on tractors and trucks, which is the most efficient and satisfactory service it is possible to give.

Carrying service means the dealer must have something to carry it in. Hundreds of dealers of all kinds have been using the car for years, but the automotive dealer is beginning to realize the value of specialized motor vehicles for service uses. These are taking various forms. The ordinary service car, in the form of a ¾- or 1-ton truck, built more to resemble a small police patrolwagon than anything else, is very common. There is no novelty about such service wagons.

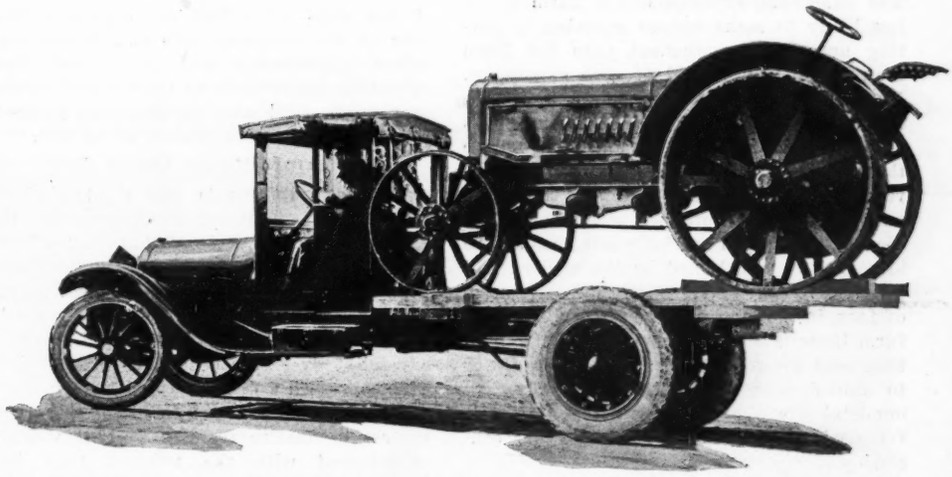
But the coming of the tractor onto the farms means a more substantial and versatile sort of service wagon. Here and there dealers are developing such. For instance, such service trucks as that designed by T. J. Micklejohn, Fond du Lac, Wis., are coming into use. This is a truck which carries a special device by which the power of the truck is utilized to load any piece of automotive equipment and transport it anywhere. It can be used for the delivery of tractors, and in an emergency it can proceed into the field where a tractor may have broken down, load the disabled machine and carry it to the repairshop for overhauling or repair.

Automotive dealers are adding such trucks to their service department. They are being encouraged to do so by the manufacturers in some instances. For instance, the Fordson organization everywhere is being urged by the home company to adopt such a contrivance to expedite and insure good service.

How Dealers Prepare Truck Outfit

Dealers who operate such trucks have found it expedient to equip them with an outfit of tools which will meet almost any contingency of field service which may arise. Also some of them carry on their trucks regularly a small assortment of repair parts most commonly needed. The idea is that when a call for service comes in it may be responded to immediately, and by going prepared for ordinary work no time will be lost in returning to the shop for parts or tools.

The automotive dealer who has a real appreciation of his duty in the matter of service and who realizes what prompt and efficient service means is sparing no pains to give such service. This includes everything in the way of shop equipment—some of the repair establishments resembling veritable machine shops in the completeness of their equipment—and the means for reaching the job quickly. It is recognized by the automotive trade that continued efficiency is the test of the value and economy for the auto-



Trucks can be used to bring the tractor to the garage for overhauling as well as for demonstrating

motive equipment bought by the farmer especially, and to insure this is a responsibility that rests upon the dealer. The attitude of the automotive dealer toward service and the completeness of his equipment to render it mark the distinction which must be drawn motive dealer and the dealer of the old type.

But in ways less obvious and far more subtle the up-to-date automotive dealer is doing things along the broader conception of service which mean a lot to the farmer. In one particular and important direction this takes the form of consideration of the sort of man who shall furnish the point of contact between the dealer and the farmer. In other words, it has dawned upon the mind of the automotive dealer that not everybody is qualified to sell automotive equipment to the farmer but that the man who solicits the farm trade must be especially trained for that vocation.

Dealers who have accumulated the greater amount of experience are almost unanimously of the conclusion that the man who attempts to sell automotive equipment to the farmer must know something practical about farming and farm operative equipment, and also he must be able to talk convincingly in the farmer language.

Practical Farm Knowledge for Sales

This is resulting in the selection of men who have had actual and practical farming experience and who develop selling ability as an after consideration. Sometimes it may be the dealer himself who has had the farm and implement experience, as is the case, for instance, with F. Le Cocq, Pella, Iowa, or C. R. Notestine, Newton, Iowa, or C. S. Brunner of the latter place. More frequently, however, a special man is hired to handle the farm automotive department. This brings actively into the trade such men as F. H. Lang, who has charge of the tractor department of the Dunlap Motor Co., Ames, Iowa, and G. E. Lebo, who exercises the same function for the Crary Motor & Implement Co., Boone, Iowa. Also such organizations as the Swaney Motor Co. and the Rude Auto Co., with several branches and covering considerable territory, are making it obligatory at their branches that the man who comes into contact with the farmer shall be a man who has had practical farm experience.

The reason behind this is logical. It is all along the one idea of rendering the farmer the very best service right from the start. The salesman, experienced in farming, is less likely to make serious mistakes in putting automotive equipment onto the farm than is the man devoid of such experience. Hence the farmer is more likely to receive satisfaction from what he buys, have less subsequent trouble with it and thus reduce the service liability. This is practical, preventive service, carried direct to the farm, and is in strict accordance with the modern idea of what farm service really means, the idea that is entertained by the modern and progressive automotive dealer. As a matter of fact, in the whole sphere of service on the farm there is no more important thing than this, that the men who represent the dealer to the farmer shall know positively and unmistakenly what they are doing. Successful dealers unanimously endorse this conclusion.

Such men as have been mentioned have worked out and have adopted very definite plans of operation. These cover nearly every phase of the automotive business and form a consistent whole, from the acquisition of a line to the uttermost degree of service to be given on it. Furthermore, the idea of these men are based on the broad interpretation of what carrying service to the farm means.

For instance, take the delivery of a tractor and the time which should be spent on the farm starting it and instructing the farmer in its operation. The opinions expressed are typical of those held by the best dealers in the automotive class.

Lebo says that in delivering a tractor it is of the utmost importance that the farmer be left not only satisfied but contented. The salesman should stay at least one day or, if necessary, two days, until he is sure the farmer thoroughly understands his machine and knows how to operate it. Haupert, Perry, Iowa, says a tractor is more liable to abuse than any other piece of equipment the farmer will buy. For this reason one never should be left in his hands until he knows all about its capacity for work and the penalty he will pay if he exceeds that capacity. Haupert says it is unsafe to leave a tractor with a farmer who merely thinks he knows all about it, but that the service man should be certain himself that the farmer knows what he thinks he knows before he is left to his own devices. The wisdom of this course is obvious.

Then there is the proper fitting of the equipment which will be used with the tractor. Swaney says this is of more real importance than is the sale of the tractor itself, because the farmer is certain to judge the tractor by the quality of the work done by the equipment. For this reason the dealer cannot pay too much attention to the proper co-ordination between tractor and equipment because this makes for a satisfied farmer and less liability to subsequent service calls.

The new idea of service will not admit the responsibility of the dealer ceases with the delivery of the tractor. This means some sort of service follow-up is essential. A typical instance of well-conceived and efficient follow-up is afforded by the plan of the Rude company. After the sale has been made the delivery of the tractor is entrusted to the foreman of the repairshop, who starts the machine and gives the farmer his preliminary instruction. A call is made a few days later by the man who made the sale to see the farmer and his machine are getting acquainted and are living peacefully together. A few days after that the regular service man of the company calls and makes such minor adjustments and gives such final operating instructions as tractor and farmer may need. Still later the salesman makes a second call to assure himself all is well.

Choice of Tractor Comes First

To make it certain the right kind of tractor and equipment has gone upon the farm constitutes an important part of the service which must be carried to the farm. This is up to the dealer. A. E. Brockmann, Manning, Iowa, for instance, before he would take the agency for a tractor at all, made a careful study of the conditions in his neighborhood which a tractor would have to meet successfully. He investigated the degree of success or failure farmers in that vicinity experienced with the tractors they had bought, and he found out why in either instance. When he had made up his mind as to the kind, type and size of tractor which appeared to him most likely to meet conditions as he had found them, he contracted for its sale, and not before. Brockmann says the greatest thing in service is to sell the right tractor and thus the dealer will disarm trouble from the very outset. The conscientious dealer is doing just this thing.

Along the line of educating the farmer mechanically as part of rendering service and making him safe and sane as an operator, every dealer who has tried the plan of holding service schools commends it. What such a school is and how it is to be conducted already has been told, so here nothing more need be said beyond adding emphasis to the statement that such schools aid greatly.

Too much stress cannot be laid upon the importance of preparedness all along the line in the automotive business. This includes everything from having the necessary stock of complete machines on hand ready for delivery when they are wanted, to the maintenance of a stock of repairs ready for emergencies and to the equipment in men and material which make certain prompt and efficient service. Every dealer who has acquired successful experience in the automotive trade makes emphatic reference to this as vital.

Quality and Promptness Necessary

The essential factor in giving service is not so much the quantity given as quality and promptness. Le Cocq, Newton, Iowa, has the right idea when he says the dealer always should be ready and when trouble comes hop to it and shoot it quick, doing an efficient job when he is at it. He says the greatest measure of service the dealer can give is to make sure every piece of automotive equipment he sells constantly is kept in a state of efficiency and competent to do the work for which it is designed. The dealer can do no more, and he should do no less.

Obviously, this means that at times the dealer may be called upon for service which looks to be excessive, but the dealers of experience who conduct their service according to this theory say it evens up in the long run and results in a 100 per cent crop of satisfied customers.

Nothing has been said here about whether service should be free or charged for. In introducing any line of automotive equipment and in rendering the necessary service on it, it must be understood that a certain amount of free service must be undertaken by every dealer. It is not possible, perhaps, to lay down any hard and fast rule about the time or amount of service which shall be given free which will be applicable to all cases.

Whether subsequent service shall be free or not will depend upon circumstances. The general rule followed by most automotive dealers to-day is to charge. It has been almost the invariable experience of dealers who have left nothing to be desired in the promptness and efficiency of their service that the farmer, for instance, does not object to paying for service of that kind. What he objects to is the sort of free service he has had too much of in the past, which has been lax and which has been inefficient. This is inevitable. It is unsatisfactory to the customer and detrimental to the reputation of the dealer to fall down in the service department. The best and most successful automotive dealers are not falling down, and they are charging for the service they give. This ought to settle it.

Georgia Boosters Get Behind Ship-by-Truck Idea

MACON, Ga., April 4—Forty-odd motor trucks demonstrated yesterday that the manufacturer, merchant and farmer within a radius of 50 miles of Macon can ship his wares more economically and with greater dispatch than by railroad. The four great freight trains of trucks carried close to 100 tons of merchandise out of this city to outlying points, the farthest of which was 50 miles. The ship-by-truck demonstration marks another step in the movement now under way in the Southeast to educate the merchant and farmer toward motorizing his business. Three weeks ago the farmer here saw how he could increase his crops with the truck. Yesterday he saw how this increased production could be readily handled by the truck. Those who participated in the affair and those who saw it, or phases of it, feel the motor truck is destined in the next few years to replace greatly the conventional mule team of middle Georgia and the South generally. One of the four runs, that to Fort Valley and Montezuma, was right through the heart of Georgia's famous peach-growing country, where each year it becomes quite a problem to move the great peach crops.

How Time Was Cut

In practically every one of the smaller towns visited by the motor calvalcade it was a revelation to see the radiant faces of the merchants who had received their merchandise from Macon in less time than ever before in their lives. Some of the articles shipped by trucks, say to Montezuma, 50 miles from Macon, would have required anywhere from three to five days, to say nothing of the repeated handling of the goods and danger of breakage. The merchant farthest from Macon on the run got his goods in about 6 hr. It must be remembered also that this included a stop for dinner and speeches in many of the towns. Every conceivable kind of merchandise was carried to grocer, butcher, druggist, hardware dealer, etc. The heaviest load recorded was that on the Duplex truck fitted with a two-wheel trailer. This outfit carried 10,000 lb. of lumber, 1000 lb. meat and four men to Milledgeville, about 37 miles from Macon. The truck left at 10 a. m. and arrived at Milledgeville at 2 p. m.

By B. M. Ikert

Motor Age Editorial Staff

Four routes had been laid out by Benjamin Gilham, traffic manager of the Macon Chamber of Commerce, which organization put on the truck demonstration. One run was to Montezuma and intermediate points, and the remaining three had as their destinations Monticello, Barnesville and Milledgeville. The weather was ideal and the roads excellent. The only mishap took place outside of Byron on the Montezuma run, where a truck went through the bridge when only half of the fleet had passed over it. This made it necessary for the remainder of the train to go back to Powersville and to Fort Valley over another road. Many of the truck drivers remarked after the demonstration that they feared some of the bridges. Frequently the fleet was stopped while the men on the leading truck looked over the bridge before venturing across. Better bridges must be built if truck transportation is to be carried on here on a large scale.

Fourteen trucks went to Montezuma, including a 2-ton Mack, ¾-ton Oldsmobile, ¾-ton Reo, ¾-ton Stewart, 1-ton Ford, 2-ton Packard, 3½-ton Sterling, 1-ton G. M. C., 2-ton Republic, 1½-ton Indiana, ¾-ton International, 2-ton Stewart, 1-ton Wilson and a Dodge Brothers. In addition to these one of the two Firestone trucks driven from Akron, Ohio, to Macon with a load of tires was entered on this run and acted as pacemaker. The Mack truck was driven to Macon from Knoxville, Tenn., a distance of 350 miles in two and a half days by Robert Maddock of the factory inspection department. The department of films of the Firestone company was on the job and caught the truck fleet at various points.

Fifteen tons of freight were carried by the trucks on the Barnesville run, the trucks leaving Macon at 10:05 and arriving in Barnesville at 3:40. This fleet consisted of a 3½-ton Packard, which was one of the two transcontinental Goodyear trucks entered and driven to Macon from Akron, ¾-ton Reo, 2-ton Filson, 2-ton International, ¾-ton Stewart, 1-ton Maxwell, 2-ton Clydesdale, 3½-ton Kelly and the other Firestone truck, which joined the fleet at Forsyth.

The Monticello run was made by eight trucks: ¾-ton Stewart, ¾-ton Reo, ¾-ton White, ¾-ton Chevrolet, 1½-ton International, 2-ton Stewart, 2-ton Indiana and 1-ton Republic.

Six trucks went to Milledgeville. These, besides the Duplex previously mentioned, consisted of a 3-ton G. M. C., 2-ton Diamond T, 2-ton Stewart, 1-ton Ford, ¾-ton Reo.

It happened that S. T. Brown, a former resident of Monticello, had recently moved to Macon. His furniture was still in Monticello awaiting shipment. All his household goods were loaded on the several trucks that made the Monticello run and brought to Macon free of charge.

The actual handling of the various shipments, looking after freight bills, etc., was in charge of students of Mercer college. These students are members of the commerce class and will use their notes and material gathered on this trip as a basis for working out costs and other items incident to shipping by truck in this vicinity.

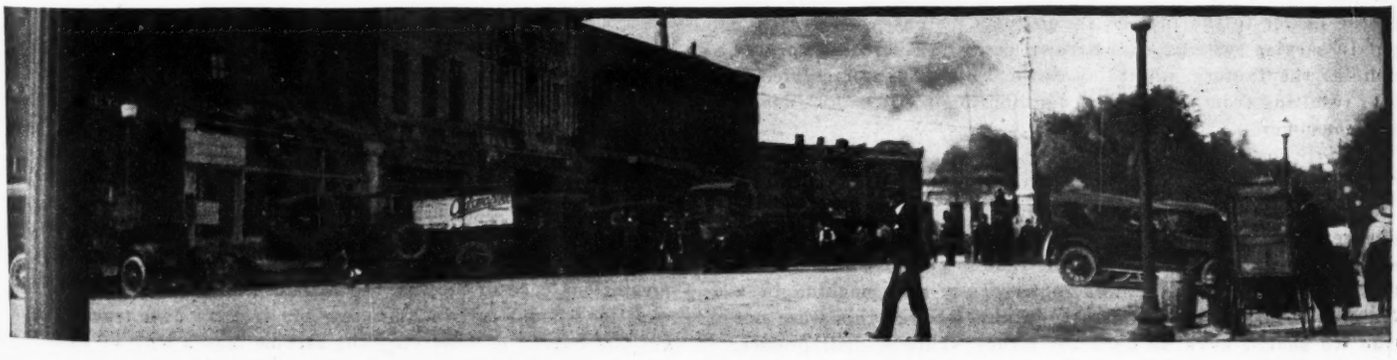
As a prelude to the great demonstration 123 trucks, most of them loaded, paraded the streets of Macon Wednesday afternoon. Eighteen makes were represented.

RICK ON POLICE FORCE

New York, April 5—Capt. Eddie Rickenbacker today was presented with a gold watch by the Contest Board of the American Automobile Association. Over a score of his old friends attended. Rick is now a lieutenant-colonel on the aerial police force of this city, having been sworn into this new role at the dinner. It is not very certain just what this aerial police force means, but those in it agree to do all in their power to protect the city and maintain order as may be necesasry.

NEW CHANDLER APRIL 10

Cleveland, Ohio, April 7—The new series of Chandler cars will be placed on the market April 10. Details of the design have not been announced. The Chandler will be made in six models.



Trucks lined up on the streets of Montezuma, one of the four objective points in the Macon demonstration

EDITORIAL

A Real Dealer Service

THE establishment of a clearing house for salesmen, sales managers and service managers by the N. A. D. A. marks the organization with the stamp of real dealer service. This has long been a need of the automotive trade. The N. A. D. A. offers to the trade a service surrounded by every safeguard for efficiency and reliability. And this service is made a possibility for the 30,000 dealers of the country, plus the service stations.

THE National Automobile Dealers' Association has done much already to unite the retail trade of the automotive industry. From the beginning it has made itself a real factor in those activities affecting the dealer. In offering this service, immediately available and without charge to dealer or applicant, it becomes even more of a factor.

DEALERS to-day demand a salesman or a manager with a personality, a high moral standard, a good commercial and technical record and such other achievements as will be of benefit in their particular lines. Likewise employees have their standards for the dealer—his spoken word must be as good as his bond, he must be reasonable in conduct toward his employees, the chance to make money must be present and the main chance always kept open. The N. A. D. A. aims to insure both dealer and employee a square deal. And if its past record is to be taken as a criterion, it will insure both a square deal.

Good Roads are Marching On

THE march of good roads continues throughout the country. Texas is the latest to join the ranks. Next November the state will vote on a bond issue of $75,000,000 to build a co-ordinating system of hard-surfaced highways. When one thinks of this state, practically 1000 miles across, both north and south and east and west, a good week's tour for the average motorist who undertakes to cross it, the huge good which will result from such a system is self-evident.

THE whole country has heard the call for better, permanent, year-round highways. If there is a community which fails to answer that call, that community as surely is one which will go backward rather than forward. How is your community on the road question? Is your county improving its roads? Has your state done anything to get better highway communication? While it is true that it is never too late to mend, it is also true that time and tide wait for no man. Get behind your local dealer organization, your local and state motor clubs, your civic organization. Talk good roads every chance you get. Write it every letter you send out. Better roads are coming but they should be here now. Your efforts will help bring them to your section of the country.

His Own Service Man

CAREFUL scrutiny of the tractor service situation shows that to a certain extent every farmer can become his own service man. All told, the whole amount of service the farmer gets out of his machine depends entirely upon the construction of his machine and the way he operates it. Also, other things being equal, the best machine will not stand up very long in the hands of a poor operator, but a poor tractor can be operated quite successfully by a competent driver. Absolute familiarity with every part of the tractor is essential on the farmer's part and constitutes the first step in service and maintenance.

SERVICE is really a system of education that starts with the manufacturer and is handed down by the distributer and dealer to the consumer. The way in which the manufacturer is inclined to render his service does not necessarily affect that of the dealer to the farmer, for in some instances dealers have put in service systems of their own entirely divorced from any policies the factory might lay down. But the best service is that resulting from a complete co-ordination of the maker, dealer and consumer.

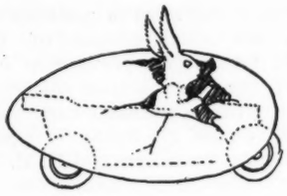
THE maker can render his share of the service by closely studying the needs of the farmer and designing his product to meet most of the conditions successfully. No tractor can be expected to do all the things all the time in all parts of the country, no more than we expect to have any one machine in a factory do all the machine work on any job. If this were not true we should have no need for lathes, shapers, drill presses, milling machines, etc. By making improvements in his tractor every year the maker sticks pretty close to his end of the bargain in the service angle.

THE dealer's share of the service consists of rendering such assistance necessary for the farmer to have at cost, plus a reasonable profit. Every dealer who sells a tractor must impress upon the farmer that he has paid some real money for the job and that it will pay him to take the best of care with it.

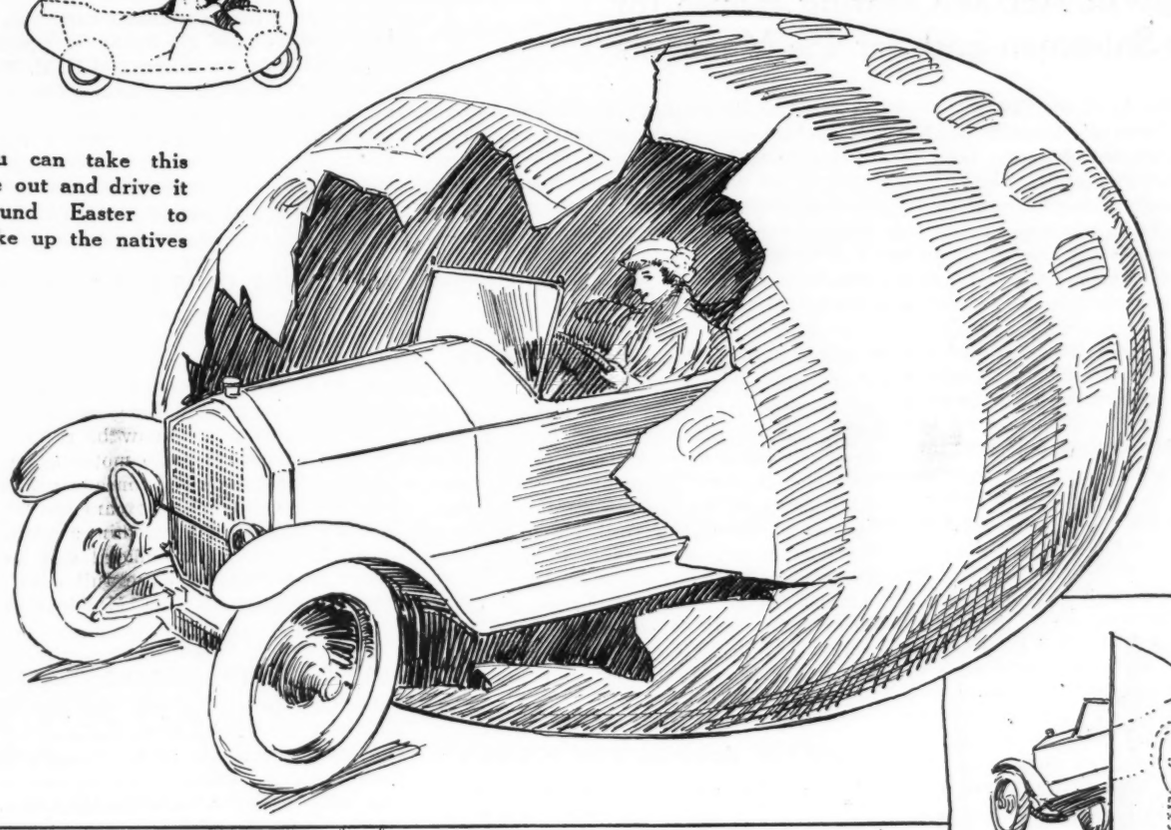
THERE is no free service. If so, it is figured in on the initial price of the tractor and the man skilled in handling his tractor on such a scheme loses out, because he pays for the man asking for free service. In other words where free service is indulged in the consumer simply pays for his service in advance. Of course, service is rendered when the machine is sold.

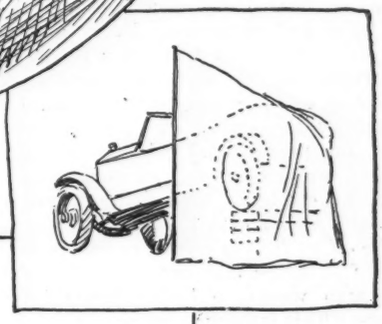
THE tractor owner can be his own service man, once he has mastered the ins and outs of his machine. Jobs like valve grinding, carbon removal, etc., are easily done and those farmers owning cars are familiar with the processes. Most of the cases where service men are called can be solved by the operator, if he has studied his instruction book and perhaps attended one of the many dealer schools established in various parts of the country. Whenever a service man is called to solve a seemingly mysterious case of trouble the farmer who owns the tractor in question should call in his neighbors if they own tractors and get the benefit of observing the service man's way of shooting trouble. Education is going to cut the service question in two.

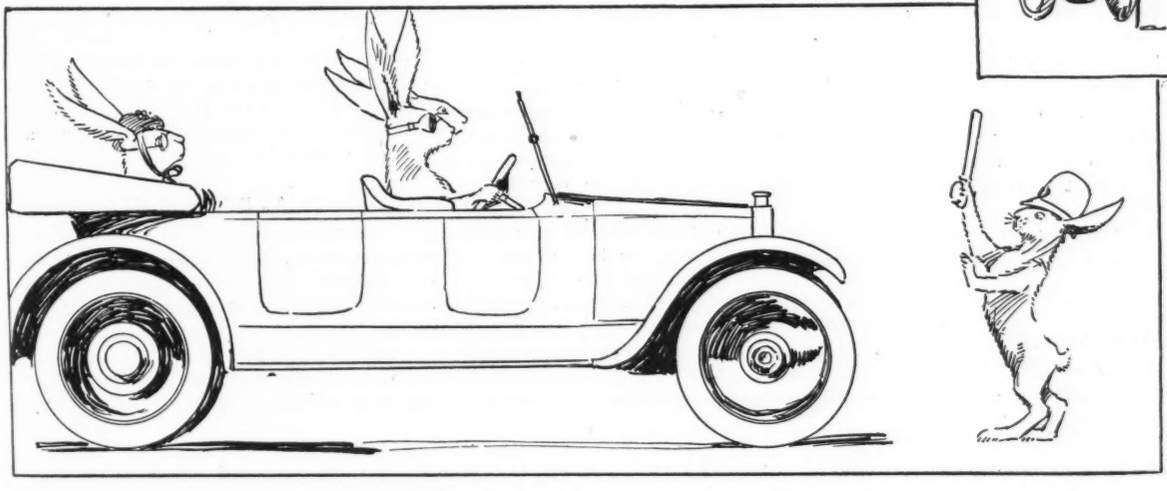
Some Easter Window Suggestions for the Live Wire Dealer



You can take this one out and drive it around Easter to wake up the natives







The "egg" can be made on a big hoop or egg-shaped loop of heavy wire. The paper should be painted in fantastic Easter-egg style and shaded to look round. Beaver board also might be used, mounted on wooden framework

These rabbits can be sawed out of beaver board and painted in natural colors, or, if one feels very energetic, they might be made of muslin stuffed and covered with cotton batting or fur

This is just a huge nest of hay or straw with eggs a foot or more in diameter, made of balls of excelsior covered with plaster of paris and decorated in gaudy colors, the whole surrounded by a floral display of Easter lilies, etc.

N. A. D. A. Opens Employment Bureau

Will Act as Clearing House for Salesmen and Service Managers

ST. LOUIS, Mo., April 5—The National Automobile Dealers' Association has opened an employment bureau, thereby filling an old need of the trade. The bureau will act as a clearing house for salesmen, sales managers and service managers. Headquarters are at the association's offices, 3124-a Locust street, this city, and the requirements of employer and employee will be filled.

For some time dealers have realized the shortage of first-class salesmen and service managers. Those who ranked 100 per cent did the natural thing, stepped over the heads of the men hiring them and went into business for themselves. As a consequence the dealers' end has been advancing steadily while the salesman's end has been at more or less of a standstill.

The N. A. D. A. placement service will be based on lines insuring a square deal for employer and employee. Every applicant and every employer will get a blank form on which to set down his needs. The record of every employee will be analyzed to satisfy the employer. As far as possible, the professional job hunter will be weeded out and every attempt made to save the employer time and expense and give him a man with the abilities required.

The effort for the employee will be on behalf of both the man out of work and the man who wants to better himself by a change. This latter percentage is not large enough to cause the right kind of employers to worry. It is estimated about 75 per cent of the firms of a business in which a man is engaged offer him his best chance by remaining with the firm.

An advistory advertising bureau for dealers has been opened at N. A. D. A. headquarters also.

BELL HEADS JERSEY DEALERS

Newark, N. J., April 4—Joseph C. Bell, former vice-president, was elected president of the New Jersey Automobile Trade Association at the annual meeting Saturday night. Mr. Bell, who is Buick manager and but thirty-six years old, has been in the industry about twenty years. Following the election a trade dinner was held in the Robert Treat hotel.

The other officers are: Vice-president, Clarence E. Fisher, Cadillac, Newark; treasurer, Lieut.-Col. R. A. Greene, Greene Motor Car Co., Newark; secretary, John B. Stobaeus, North Jersey Motor Vehicle Co., Newark; directors: Gordon B. Phillips, Hupmobile, Newark; C. R. Zacharias, Zacharias Garage Co., Asbury Park; Charles W. Smith, Central Motor Car Co., Bloomfield; George Paddock, Paddock-Zusi Motor Car Co., Newark; George E. Blakeslee, Crescent Automobile Co., Jersey City; H. A. Bonnell, Dodge, Newark. Directors holding over are: W. H. Ellis, J. W. Mason, John B. Wallace, Lieut. William L. Mallon and George D. Thayer.

The association plans to amend the lien law and remove some of its objectionable features to forestall opposition which arises at each session of the legislature. An effort also is being made to secure the rebate of tax penalties imposed because some dealers did not understand they would be classed as manufacturers under the old tax if they added bodies to cars. One dealer has been assessed a penalty of $3,400 and taxes aggregating $10,000 all told.

MILWAUKEE CONSIDERS TRAFFIC

Milwaukee, Wis., April 7—The first organized effort to arrive at a solution of Milwaukee's growing traffic problem has been put under way by the Milwaukee Automobile Dealers' Association. A conference was held April 3 at which representatives of more than twenty-five commercial, civic and other local organizations were present. A working committee finally was chosen and the experiences of other large cities will be collected and a plan worked out to go into effect May 15, when the motoring season usually reaches its height.

GARAGE ASSOCIATION FORMED

Boston, Mass., April 5—The Garage Association of Metropolitan Boston is the latest addition to the organizations in Massachusetts. It now has a membership comprising active and associate members of more than 500, and it plans to extend its activities throughout Massachusetts first and later all over New England. It has been in existence but a short time, and the owners of all the big garages in the city have joined it.

A few days ago it showed its strength when a bill was before the legislature to put restrictive legislation on garages. Members from Boston, Worcester, Springfield and other places were on hand and they made such a strong showing that the bill was killed. April 22 the association is to have a big dinner at the Hotel Brunswick, when it will have as speakers John R. Murphy, fire commissioner of Boston; Frank L. Lewis, fire prevention commissioner of the Metropolitan district, and Walter L. Wedger, the state expert on combustibles. James N. Scully is president; W. F. Bennett, treasurer, and H. R. Tosdal, secretary. The organization is considering affiliating with other garage associations throughout the country, such as the big association at Chicago. Its officers and members plan a campaign to disabuse the public mind that garage owners are out to get everything they can from the motorists.

FREIGHT CARS FOR MOTORS

New York, April 4—Regional railroad directors in the West and South have issued imperative orders that freight cars for the transportation of motor cars and which have been used for general purposes during the war, must now be returned as speedily as possible into motor car manufacturing territory. In consequence of the orders 539 empty freight cars passed east through Kansas City within a period of 48 hr. last week. An official will be stationed in Detroit to have full control of the distribution in the Michigan-Toledo zone.

CHICAGO TRADE TO FETE RICK

Chicago, April 7—The Chicago Automobile Trade Association, assisted by the Chicago Automobile Club, Chicago Motor Club and other motor organizations of the city will tender a reception and banquet to Capt. E. V. Rickenbacker, America's leading ace, at the Congress hotel, April 23. As this signalizes the opening of the Victory Loan drive in the trade, the affair will be known as the Rickenbacker Victory Loan dinner. Arrangements are being made for 600 guests.

N. A. D. A. REPRESENTATIVES

St. Louis, April 4—W. H. Williamson, recently a dealer, has been made N. A. D. A. representative in Texas. He also will represent the Texas State Dealers' Association.

Lieut. N. L. Tooker, recently discharged from the Army, has been appointed traveling field secretary of the N. A. D. A. for

St. Louis Dealers in Campaign Against Accidents

ST. LOUIS, April 4—The ninety-two firms associated in the Motor Accessory Dealers' Association of St. Louis have enlisted in a definite campaign against motor accidents. Robert E. Lee is secretary of the association.

Dealer and Employees

This step is taken because a means has been found whereby each dealer and his employees can have a definite part in this campaign. This is brought about by a blank form, which will be carried by each person enlisted. This form designates the traffic offense notices, and is signed by the person reporting it. It is sent to the board of complaint at the city hall and will be kept on file. When any driver is arrested for speeding, or other offense, the judges of the city courts have agreed to refer to this file in the board of complaint office. If many complaints are filed there, the defendant will be considered an old offender and punished accordingly.

It is expected the dealers' association, the commercial vehicle association and the garagemen's associations will join in this movement, as the number of accidents is coming to be a serious factor in restrictive law making and, it is feared, will materially affect the motor car business.

The first step in the promotion of the campaign will be to have street car motormen and conductors instructed to watch for machines and report those that pass streetcars while the latter are stopped to let off passengers. Policemen also will be enlisted to report such infractions of the law as they see and for which they are unable to make arrests because the car moves away from them. The cards will be supplied by the safety council, an organization under the protection of the chamber of commerce.

the eastern division with headquarters in New York. Mr. Tooker was formerly a dealer but was advertising man for Bosch for six years.

Robert E. Magner, whose appointment as field secretary for Washington, Oregon, California, Utah, Idaho and Nevada recently was announced, has begun his work. Mr. Manger is a former president of the Seattle Auto Dealers' Association.

WHITE SALES GAIN

Cleveland, Ohio, April 4—Gross sales of the White Motor Co. increased 53 per cent in the year ending Dec. 31, 1918, over sales for 1917, the increase being $13,810,348. The balance for 1918 is $1,400,585. This compares with $2,520,308 in 1917. The decrease is caused by the larger Federal taxes.

The annual report of the company points out that the financial condition at the end of the year was excellent. Production, of course, was largely influenced by the requirements of the war, in addition to a largely increased commercial demand, which, however, it was necessary to curtail because of the war. Sales included 6451 trucks for the U. S. and French governments as against only 1358 trucks for war purposes in 1917.

The company has sold in all, to the Allied nations, including the United States, nearly 18,000 trucks at a valuation of over $52,000,000.

BRADDON MOTORS GETS PLANT

Chicago, April 7—The Braddon Motors Co., a new concern involving Chicago capital, has been organized to build a small four-cylinder car and has secured a factory building at Downer's Grove, Ill. The moving spirit in the organization is George J. Fogle, vice-president and general sales manager, formerly with Locomobile and more recently with Maibohm at Racine, Wis. Other officers are: F. J. Clark, president, and John Voiral, secretary-treasurer. The company is capitalized at $50,000 and is completely financed.

Production at the rate of four cars a day will begin within the month. The car will be assembled from standard units, but painting and trimming will be done at the factory.

To Sell No Army Cars Now—May Later

Makers Will Get Chance to Take Surplus and Save Market

WASHINGTON, April 4—A possible surplus of Army trucks and cars is now considered likely and if there are more vehicles than can be used by the Army these will be disposed of by the director of sales according to a plan designed to protect both the War Department and the industry. After the inventories, which are being taken by the War Department, are completed, if a surplus of motor vehicles is found, the different branches of the Government first will be consulted to learn whether a surplus in the War Department of cars and trucks can be used to fill their requirements.

Various manufacturers of cars and trucks will be approached next to ascertain whether they will take over the vehicles of their own make to market them with their own machines to secure a fair market price for the Government, and at the same time prevent disturbance of market conditions. The net surplus remaining after the various branches of the Government and the manufacturers have been consulted will be disposed of to the public through auction or by sealed bids. Full publicity will be given this sale throughout the country in order that the Government may realize the best results.

In the meantime the public should understand that no trucks or cars are being sold. It is anticipated that between the various Government departments and the manufacturers, whatever surplus is available, will be taken up by them.

CROW-ELKHART UNDER OFFICIALS

Elkhart, Ind., April 5—The affairs of the Crow-Elkhart Motor Corp. are again under its officials, the properties having been turned over to them by M. E. Hoshaw, who since Oct. 12 has been operating the plant as trustee. This was made possible through the sale of $600,000 worth of notes, the greater part of which are being taken by the 4,200 stockholders and the larger creditors. The larger creditors have been organized into an advisory committee by the financiers. It is planned to continue the manufacture of Crow-Elkhart cars along conservative lines and to build the production gradually to fifteen cars a day in the next sixty days. Orders are booked now for the first sixty days' production.

The personnel is as follows: President, M. C. Crow; first vice-president, E. C. Crow; vice-president and general manager, M. E. Hoshaw; secretary, D. C. Thomas; treasurer, Henry Lichtig; vice-president and purchasing agent, H. B. Schmid.

HANSON IN PRODUCTION

Atlanta, Ga., April 5—The Hanson Motor Co. has increased its capital stock from $375,000 to $1,000,000 and plans on a production of 2000 cars this year. Although the company has been in existence only a year, it has met with considerable success, a good many of its cars having been sold in this section. Orders on hand now are about 800. The car is made from standard units, including Continental engine, Timken axles, Long radiator, Covert gearset, etc. The factory is at Oakland City, near Atlanta, and space recently has been added with an output of twenty-five cars a day before long in view.

BUY A REBUILT PLANE?

Buffalo, N. Y., April 7—Plans to rebuild and sell at popular prices used planes are announced by W. W. Moss, controller of the Curtiss Aeroplane & Motors Corp. This follows the War Department's sale of $2,720,000 worth of airplane engines and planes to Curtiss.

It is the Curtiss company's plan to use this and other material now on hand in rebuilding used machines which are to be sold to buyers for pleasure or commercial purposes. Some of these may be sold for $2,000, Mr. Moss said, while the highest price asked for a used machine will not exceed $4,000.

The company's purchase included 4608 Curtiss EMOX-5 engines, 1615 EMJ-4 planes and 1100 Standard planes. Most of the material was either obsolete for Army purposes or condemned as unfit for the use for which it was purchased.

LOUISIANA TAKES BOUR-DAVIS

Shreveport, La., April 4—The Louisiana Motor Car Co. has taken over the production of the Bour-Davis car and is putting through a run of thirty-three jobs and will bring out also a 2-2½-ton truck. One hundred of these are going through. The company has been in existence for a year, in actual production for about four months, and has produced to date twenty-four cars and two trucks. W. F. French is general manager of the company, which is capitalized at $1,000,000 and headed by T. H. McGregor. Other officers are E. C. Rhodes, vice-president; factory manager and engineer, William Ross; chief designer, A. L. Vargha.

Iowa Organizes a State Motor Trades Bureau

DES MOINES, IOWA, April 4—The Iowa Motor Trades Bureau was launched here this week, and for the first time in years Iowa now has a real organization to look after the rights of the automotive industry of the state. The formation of the bureau came after a two-day session and was attended by fifty of the representative dealers of the state. Fifteen local trade organizations were represented, and for the time being the bureau will work largely as a clearing house of the local organizations and will not make an attempt to create a large individual membership.

John Rude, Perry, was elected president and John Hanson, Waterloo, vice-president. R. J. Clemens, Des Moines, will be treasurer and a secretary will be chosen later. Members of the directory board are L. A. Walsh, Dubuque; C. E. Alford, Davenport; James Brown, Creston; George Darling, Marshalltown; O. O. Repass, Waterloo; Perry Rude, Cedar Rapids; W. B. Swaney, Carroll; R. W. Royer; W. D. Tremain, Fort Dodge; E. C. Walton, Council Bluffs, and C. C. Hart, Des Moines.

The primary object of the new organization is to protect the motor car interests of Iowa, particularly in regard to legislative matters, and the first work was accomplished at the formative sessions, when the members brought force to bear upon the Iowa house of representatives to pass the good roads bill.

The bureau claims that with 7470 motor trades concerns in the state employing 60,000 and doing a yearly business of more than $100,000,000 it is entitled to voice its opinions in regard to matters vital to the business.

Production Takes an Optimistic Slant

Daily Output of Thirty-two Makers in March Was 5,741 Cars

DETROIT, April 4—Production in Michigan and Ohio is beginning to reach normal figures. During March the daily output of thirty-two big factories was 5741 cars. This is a big gain over February figures, during which 4822 cars were produced daily. In January, when the majority of the plants were just getting into commercial manufacture on greatly curtailed schedules 3684 machines a day were built. The average daily production for the first quarter is 4749 cars. On a basis of twenty-six working days to a month, these figures show an estimated total production for the first three months of the year of 116,142 machines.

Manufacturers are beginning to talk in terms of annual production. Many of the companies have drafted production schedules for 1919. Others, while outlining production for the year, are not making them public. However, from the statistics already secured it is evident 1919 production schedules call for in the neighborhood of 2,500,000 cars. With nine factory figures missing, the proposed output in the two states for the year is approximately 2,139,500 cars. Chalmers, Maxwell, Chevrolet, King, Oldsmobile, Packard, Reo and Saxon data is not available, but it is safe to estimate the combined production of these nine concerns will be about 225,000 machines.

Estimating the 1919 output at 2,364,500 and dividing this into quarters, the factories must turn out 591,125 cars quarterly if they hope to operate on schedule. Thus it is to be seen that the 116,142 first quarter production is far below the plans of the manufacturers and that it must be increased 75 per cent the next three months.

Big Increase This Month

This increase will be very noticeable during April. Packard will be in production. Hudson will double Hudson and Essex production. Buick hopes to attain the 600 daily production mark. Willys-Overland will be beginning to get production on its new light car. Oldsmobile and Reo propose big production increases. Studebaker is running up production approximately 40 per cent a month, while Ford will be hitting the 3000 mark.

In 1918 car production figures were 1,044,754 against 1,737,151 the previous year. In 1916 production was 1,493,617 cars. Last year's production was the smallest since 1915. Normally the output increases at the rate of 40 per cent a year. Had this rate prevailed last year the output would have been 2,750,000 cars, or more than double what it actually was.

Some of the Detroit companies are having trouble getting material and parts. This is not true in all cases but in several instances it is badly curtailing production. The trouble seems to be due to inability of certain part makers to get back into peace production from a war basis. Firms dealing with these concerns are affected while others are not. Lack of funds, owing to unadjusted Government contracts, and the unstability of the steel market are the big factors at the bottom of the trouble. The fixing of the steel prices by the Government is relieving this situation, as this market is beginning to gain confidence again even if the prices are a little high to suit the majority of the buyers.

For a few days following the fixing of the steel price by the Government the trade was uncertain and continued its hand-to-mouth buying policies. Now, however, the companies are beginning to purchase steel in larger quantities. The immediate effect of the fixing of the price as far as the automotive industry was concerned was the stimulus it gave building operations. Several of the plants have placed orders for structural steel, and there is going to be a healthy increase in factory construction this summer.

Columbia soon will be housed in a new factory. The present plan is not adequate to care for the expanding business of this company and architects are at work on plans for a complete new establishment. Details and its location will be made public shortly.

Daily production figures for the first quarter of the year together with the proposed annual output of Michigan and Ohio car plants are as follows:

Car	Jan.	Feb.	March	Proposed Production for 1919
Buick	100	400	450	140,000
Briscoe	30	50	50	15,000
Barley	...	4	10	2,000
Cadillac	55	60	80	15,000
Chalmers	30	65	70	.....
Chandler	...	50	90	18,000
Chevrolet	...	300	350	.....
Columbia	8	10	15	4,000
Dodge	300	375	400	150,000
Dort	40	65	70	15,000
Ford	2000	2000	2400	1,250,000
Harroun	4	4	10	6,000
Hudson	30	50	50	20,000
Hupp	38	55	65	18,000
King	...	4	10	.....
Liberty	15	15	25	10,000
Maxwell	150	150	220	.....
Monroe	5	5	8	2,500
Oakland	160	160	200	60,000
Olympian	4	5	10	5,000
Oldsmobile	...	110	140	.....
Overland	320	400	442	180,000
Packard	...	...	1	.....
Paige	50	55	55	25,000
Paterson	10	10	10	2,000
Jackson	...	...	...	.....
Reo	100	100	125	.....
Saxon	10	50	65	.....
Scripps-Booth.	20	45	45	10,000
Studebaker	150	150	175	160,000
Essex	30	50	50	20,000
Grant	25	35	50	12,000
Total	3684	4822	5741	2,139,500

DETROIT AWAITS DEVELOPMENTS

Detroit, April 4—The industry here is awaiting with keen anticipation the outcome of several important matters this week, interest centering in General Motors,

Lieut. Andre Boillot, who will fly at Indianapolis race, and his Spad

Resta Will Race at Indianapolis

CHICAGO, April 7—It is now stated that Dario Resta will drive the second Sunbeam at Indianapolis, May 31. Andre Boillot, as anounced previously, may start in the race with a 160-cu. in. Peugeot. But whether he does or not he will fly a Bleriot-Spad airplane during the race.

Word comes from MOTOR AGE's European correspondent that in all probability there will be a Grand Prix road race in France next year. The Automobile Club of France will celebrate its twenty-fifth anniversary then and intends to mark this happy event by several big demonstrations, of which a road race will be one. No official anouncement has been made, but the feeling of manufacturers in general is in favor of road racing next year.

In addition to the national race, there will be a big speed contest in the neighborhood of Marseilles in 1920. The energetic club of this district intends to organize a really important speed contest, which will be held over very fine roads, a little to the north of Marseilles. This district is particularly well provided with broad, fast roads, and a circuit can be found which avoids all villages and is not cut by any railroad crossing. Conditions of the race have not been announced.

Saxon and Maxwell-Chalmers affairs. The trade also is discussing some pretty authentic rumors of a new car to be brought out soon by C. Harold Wills.

Failure of Saxon stockholders to take advantage of a special meeting in New York to approve reorganization plans has caused officials to give out the statement that the reorganization plan of the creditors' committee as endorsed by Detroit, Chicago, Boston and New York banks probably will be approved. The plan practically means the cancellation of present Saxon stock and the issuance of new stock and bonds to the amount of approximately $7,000,000. The coming week probably will see a meeting of the creditors' committee, Saxon officials and the bankers interested, either in Detroit or Chicago, at which time the proposed plan will be approved.

Detroit knows little about the proposed Maxwell-Chalmers merger, which is said to be steered by General Motors, and which, if materializing, practically will give General Motors control of the two companies. It is said General Motors will refinance the combination, taking over all of the common stock. W. C. Durant and other General Motors heads have nothing to say regarding the plan at this time, and no information is being given out at Maxwell-Chalmers headquarters.

It is said Walter Flanders, president of Maxwell, which is operating the Chalmers properties under a five-year contract, is soon to resign from the company. It is added he is disposing of all his Detroit properties and proposes to locate in Chicago. Mr. Flanders himself is not discussing the matter.

CHRYSLER IS G. M. V.-P.

Detroit, April 4—Walter P. Chrysler, now president and general manager of Buick, has been made vice-president in charge of all General Motors operations and assistant to W. C. Durant, president. This new arrangement does not involve any material changes in the policy of the independent management of the General Motors division.

Mr. Chrysler will be succeeded as general manager of Buick by Harry H. Bassett, who has been associated with Mr. Chrysler as assistant general manager for several years.

HIGHWAY MEN MEET

Chicago, April 8—Some 400 representatives are meeting here today, and is is expected that a federal highway council will be organized. The organizations are working for a national highway system to be built and maintained by the Government and propose to get behind the Townsend bill introduced in the last session of Congress. This would provide $425,000,000 for a network of highways "to comprise not less than two main line roads in the state."

CHASSAGNE SAILS FOR U. S.

Chicago, April 8—A cable has been received from MOTOR AGE's European correspondent as follows:

Coatalen, Sunbeam engineer, and Chassagne, driver, will sail from Liverpool April 15. Other French drivers sail from Havre May 3.

Plans for G. M. Expansion in 1919

New Plants and Additions Involve $37,398,000 in Ten Cities

DETROIT, April 4—General Motors expansion plans for 1919, as outlined by William C. Durant, president and general manager, entail an expenditure of $37,398,000 in new plants, additions, office and sales buildings and new equipment in Detroit, Flint, Pontiac, Lansing, Saginaw, Toledo, St. Louis, Mo., Janesville, Wis., Bristol, Conn., and Muncie, Ind.

Detroit will get the lion's share of the appropriation, $12,650,000. General Motors expansion in Detroit includes a complete new plant for Cadillac; a sales and service building for the same company; a $5,000,000, fifteen-story general office building for the General Motors and its subsidiary units, with a four-story research laboratory in the rear; a differential gear and transmission plant; a general heating and power plant; extensions to the Central Forge Co. and the Northway Motor & Mfg. Co. plant, all to be located on Holbrook avenue.

The office building will be the largest and finest in the city, it is said. The building will cover an area 482 by 336 feet. Four wings will extend from front to rear and these will be connected by a central wing, this plan offering direct outside light to every office in the building. The ground floor will contain salesrooms for all the subsidiary companies as well as service stations for the United Motors Corp. In the center of the building and on the ground floor will be an auditorium seating approximately 1000 to be used for conventions and other purposes. The laboratory in the rear will be 60 by 480 ft. It will be four stories high with approximately 50,000 sq. ft. of office space on each floor. The entire building, including laboratory, will have a floor area of about 875,000 sq. ft. exclusive of corridors, etc.

General Motors will spend 6,715,000 at Flint, where large plant extensions to the Buick and Chevrolet companies are proposed. The remainder of the appropriation will be used to build 1000 homes for employees, with water mains, sewer systems, paved streets, etc.

Lansing Projects

Lansing projects total $2,540,000. A new axle plant will be built and large extensions made to the Olds Motor Works division. At Saginaw $2,427,000 will be spent in extensions to the Central foundry, motor and steering gear departments for the Saginaw Products division and a central heating plant. Toledo will get $543,000 for extending the transmission department of the Chevrolet branch factory there. A new plant will be built for the St. Louis Woodworking Co., St. Louis, Mo., as well as large assembling plants for the Buick and Chevrolet division in that city. These improvements will cost $4,135,000.

Janesville, Wis., projects total $4,500,000 and include plant extensions for the Janesville Machine Co., Samson Tractor Co. and hundreds of houses for employees. At Bristol, Conn., $1,028,000 will be spent in extending the present plant of the New Departure Mfg. Co. At Muncie, Ind., $800,000 will be spent in plant extensions and houses for employees.

MONGANA LEAVES FORD

Detroit, April 4—Charles Mongana, Jr., who resigned as junior assistant chief engineer of the Ford Motor Co. this week, has associated himself with his former chief, C. Harold Wills. Mr. Mongana was with the company for seven years and during the war was in charge of its Liberty engine operations. A. M. Wible succeeds him at the Ford plant. He has been connected with the Ford engineering department for some time.

BARNES LEAVES PARRETT

Chicago, April 8—Claire L. Barnes has resigned as vice-president and general manager of the Parrett Tractor Co. Mr. Barnes was instrumental in the reorganization of the Parrett Tractor Co. a year ago and at that time took over the management of the company's affairs. Feeling that his work with this concern has been completed, Mr. Barnes has resigned to devote his time to the development of other interests. Mr. Barnes is a well known figure in the industry, having been for years associated with John N. Willys in the management of Willys-Overland properties.

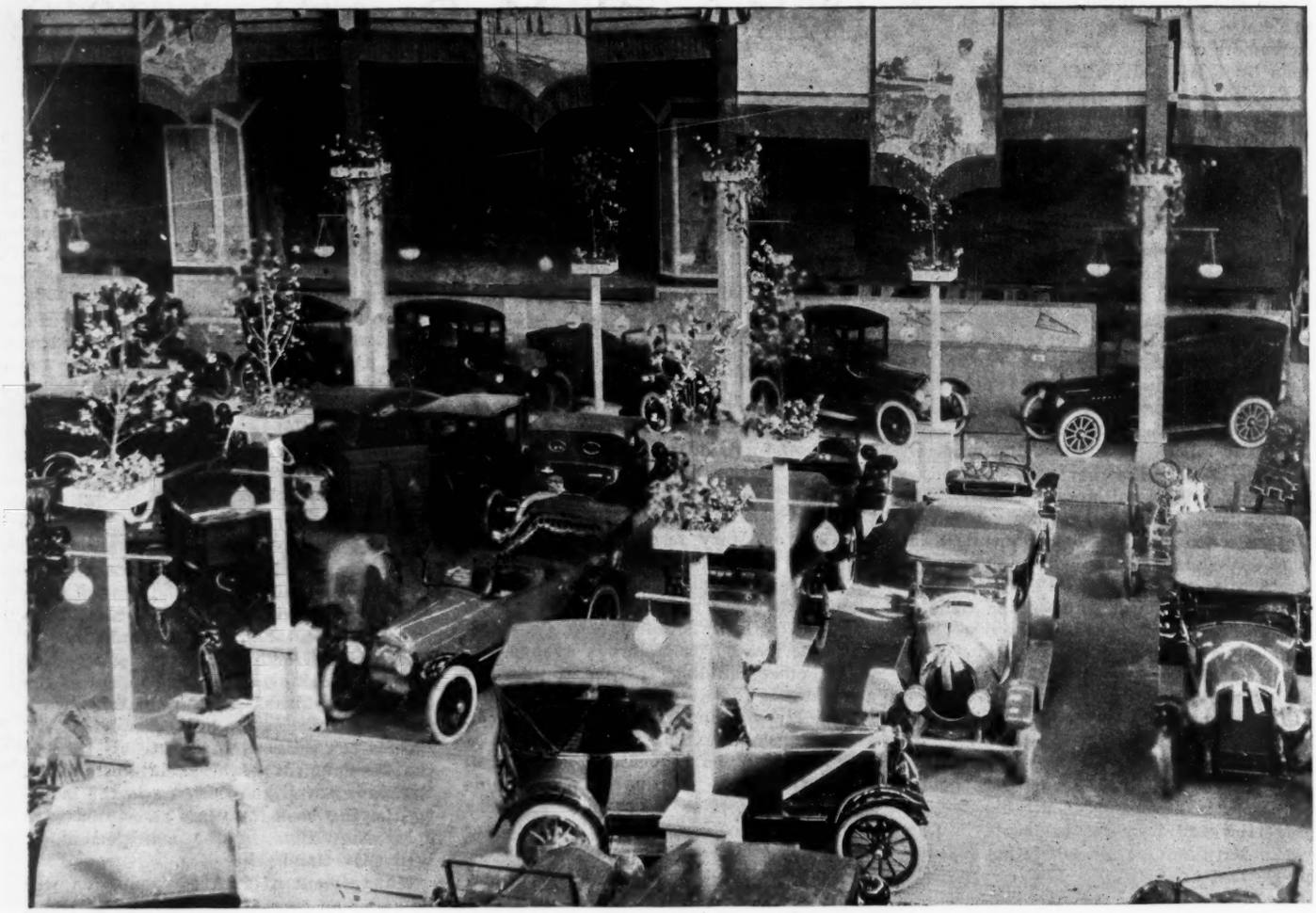
Management of Parrett production will be under an executive committee of three, under the chairmanship of President Dent Parrett, who recently returned from the service as a captain in the ordnance department.

FRANK W. HASKELL DIES

Buffalo, N. Y., April 4—Frank W. Haskell, president of the Carborundum Co., Niagara Falls, died Wednesday at Daytona, Fla., of heart trouble. In addition to being directly interested in the production of materials entering into the automotive industry, Mr. Haskell was a very enthusiastic motorist, a member of the Automobile Club of America and Automobile Club of Buffalo and a tourist of considerable note. His motoring activities began with one of the very first Pierce cars ever built, at that time called the Pierce Motorette. Since that time he has kept a complete log of every tour and trip of any length taken by motor car. These logs are very interesting, as they were kept accurately and are quite unusual in their detail.

WALL BACK AT NATIONAL

Indianapolis, Ind., April 5—Lieut.-Col. William G. Wall has returned to his position as vice-president and chief engineer of the National Motor Car & Vehicle Corp. after almost two years of Army service. Colonel Wall was one of the first automotive engineers to be called to assist the Government in war work and headed the section of the Ordnance Department charged with the design, construction and maintenance of armored cars, tanks, ammunition trucks and artillery tractors.



This is part of the car section at Denver's automotive show, which includes cars, trucks, tractors, trailors and equipment

Trade Flocks to Denver Show

Dealer Attendance Puts Event Far Ahead of Its Predecessors

DENVER, COL., April 4—The Denver Automobile Trades Association's automotive show opened Tuesday night in the Stockyards Stadium with an attendance of 10,000. A total attendance of at least 30,000 is predicted for the five-day event by the show committee, with an estimate of 10,000 or more visitors from Colorado districts outside of Denver and from New Mexico, Wyoming, Utah, Western Nebraska, Western Kansas and perhaps even more distant territory. From the standpoints of enthusiasm among dealers and salesmen and evidences of prospective buying interest on the public's part, eastern factory representatives say the big Rocky Mountain event promises to equal any of this year's shows.

Thirty-five passenger car distributers are showing fifty makes of cars, while forty-six makes of trucks, tractors, truck bodies and trailers are displayed by thirty-eight dealers, and there are forty-eight accessory booths covering a wide range of car and shop equipment. In addition, there is a large exhibit of farm implements, sheltered by a canvas canopy, on a triangular piece of ground between the stadium and the large horse-show building housing the truck exhibit and part of the tractor display. The rest of the tractor exhibits are along the circular wall of the stadium, which has cars exclusively in the center, with a circle of accessory booths bordering and broken by four entrances to the arena portion. The exhibits in the two buildings occupy more than 50,000 sq. ft. of floor space, which is practically three times the space in the Municipal auditorium, where former motor shows were held.

A feature of the opening night was a short talk on the automotive industries by Ralph de Palma, who is here to give a 3-mile exhibition drive in his airplane-engined Packard.

Value of Separate Sales

The value of maintaining separate sales organizations for trucks or tractors is being emphasized by the show visitors' demands for specialists to answer questions regarding the various exhibits, distributers state. Of Denver's three dozen truck distributers, eleven handle trucks exclusively, while about half the combination car and truck distributers have separate sales forces for trucks. Ten of the city's thirty tractor distributers handle tractors exclusively, and about half of those selling tractors and cars maintain separate organizations. In the tractor field, however, there is a greater tendency to combine tractors with general farm implements. The separate organization plan also is followed by perhaps 50 per cent of the leading car dealers who sell farm lighting systems, and the plan is gaining favor in connection with all these substantial branches of the motor industry.

The show decorations include a wall circle of paintings showing varied vistas of Colorado's mountain scenery, panels of tractor plowing and general farming, mining, stock-raising and other industrial scenes. The car names are shown on lamp globes, and indirect lighting is used throughout. A huge dirigible balloon, suspended from the steel girders, has a bandstand swinging below, while ballet dancers give a butterfly-form dancing exhibit swinging on steel cables fastened to the

girders. The decorations are very good.

From the standpoint of dealers' attendance, the show is far ahead of any event of its kind ever held in this territory. About 2000 dealers are taking in the show, and 600 to 800 are expected at a bigger-business banquet tonight in the Albany hotel. The general manager of the show is Harrison Goldsmith, secretary and business manager of the association.

One feature attracting considerable attention is the wearing of dress suits by practically all the salesmen representing the fifty passenger cars shown.

The vast development possibilities in the four states comprising the main part of the Rocky Mountain distributing territory form a substantial foundation for the abundance of enthusiasm demonstrated in connection with the Denver show. Direct sales and prospective sales are also playing a strong part to keep this enthusiasm at a high pitch.

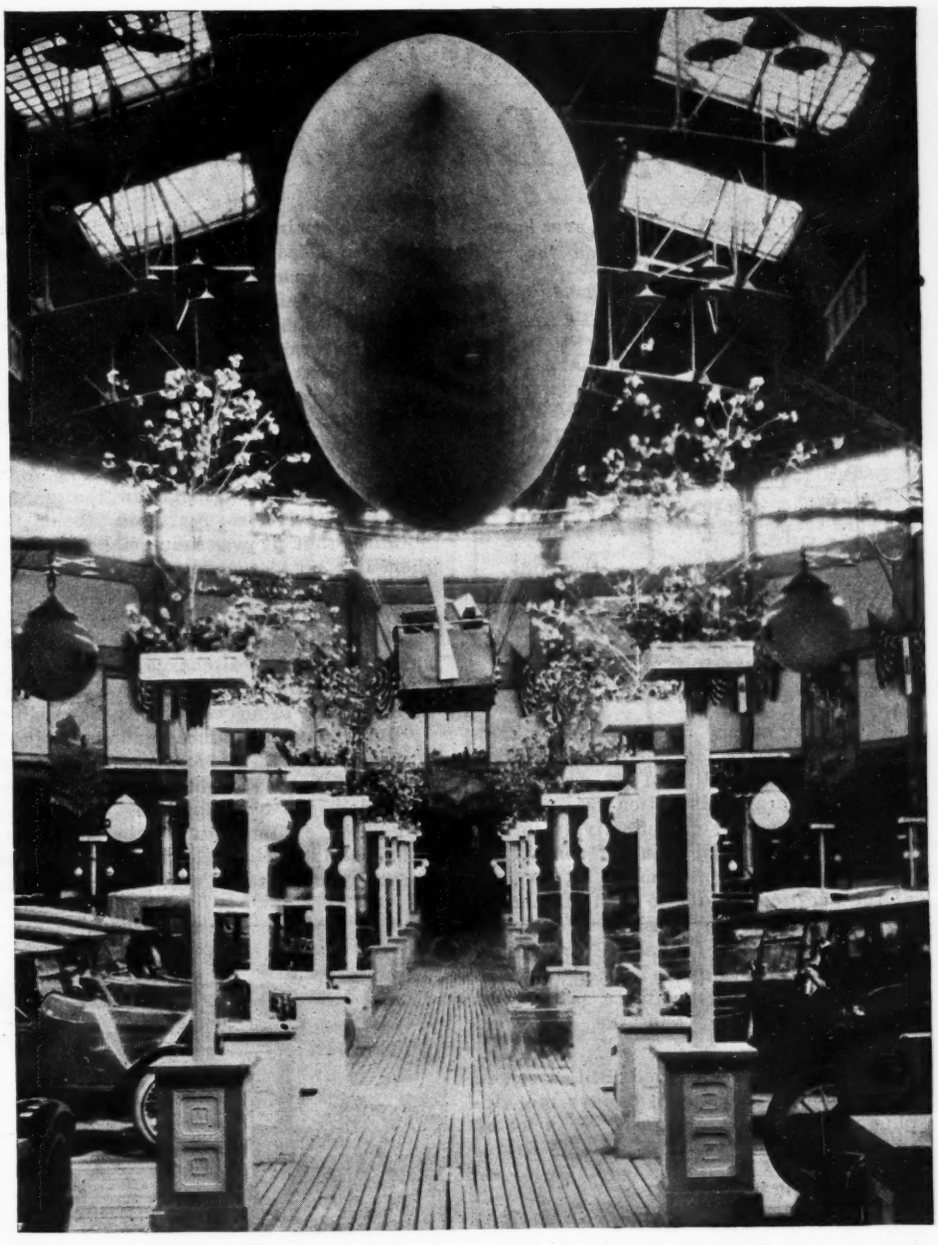
These four states—Colorado, New Mexico, Wyoming and Utah—form an agricultural, stock-raising, mining, industrial and tourist empire of 405,939 square miles, with a present population of 2,045,000. When city dwellers stop to think that this immense territory of rich resources contains a little more than half as many people as Chicago, they will find an excellent stimulus to start their imaginations working on the subject of the development possibilities that have gained such a powerful grip upon tradesmen in all branches of the industry.

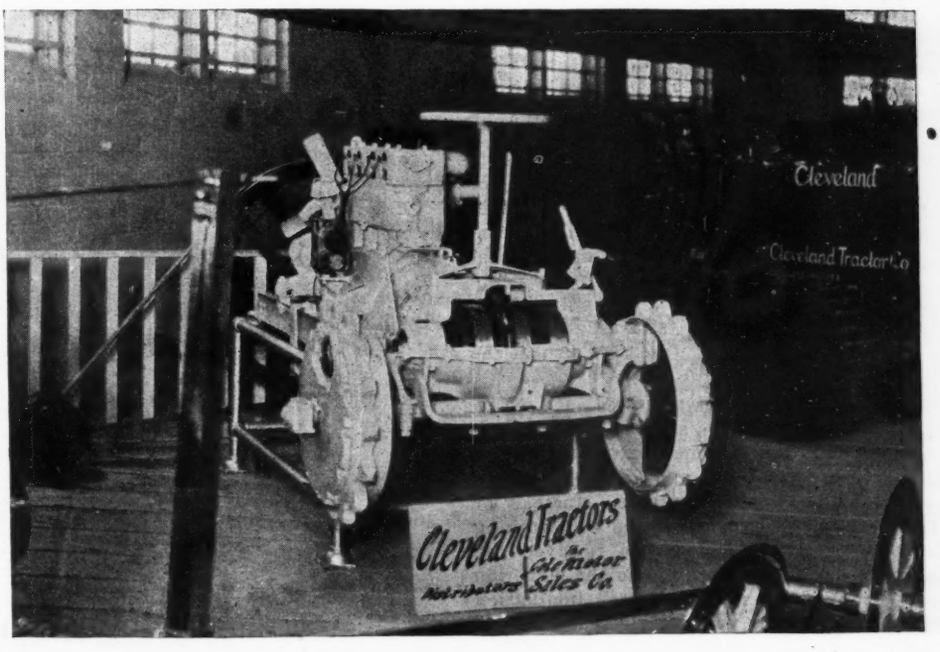
Trade Outlook Good

A specific illustration of the trade outlook is the practically unanimous report of Denver's thirty tractor distributers—"Oversold and hoping desperately for that factory promise of increased production to make good by July." Tractors are making tremendous progress throughout this territory, especially in the vast areas of dry-farming prairies being developed in all four states. Colonization plans now under way are expected to give further stimulus to this particular industry also, through increasing the number of settlers greatly in the dry-farming regions. Western Nebraska, western Kansas and northwestern Texas, which also are included in the territory of several distributers here, are becoming more and more tractor-cultivated.

The only state furnishing an official record of its number of tractors is New Mexico, which reports 341 in use there, with favorable prospects for a substantial increase this year. The New Mexico legislature recently passed an act for a Soldier Settlement Board, and colonization is looked for on a large scale. The state now has 360,000 inhabitants.

Substantial gains are being made in registration in the entire Rocky Mountain territory, with an especially good showing thus far this year as compared with the same period of 1918, while extensive highway improvement projects and a rapid development of the highways motor transport industry insure a steady advance in trade.

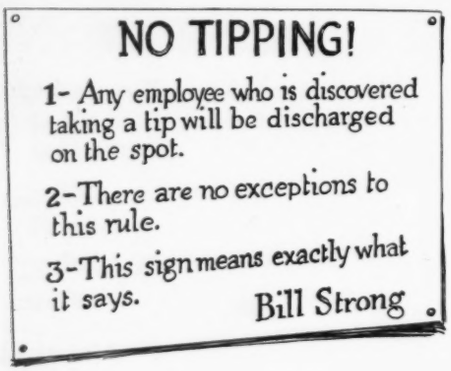




The Cleveland tractor exhibit at Denver included a "skeleton" to show the working parts. A dirigible bandstand was located in the car section

"Cure That Tipping Evil" Says Bill Strong

"BILL," I asked, "did you ever have to carry out the threat on that sign over there which says:


NO TIPPING!
1- Any employee who is discovered taking a tip will be discharged on the spot.
2- There are no exceptions to this rule.
3- This sign means exactly what it says.
Bill Strong

Bill swung around to make sure he knew which sign I was looking at and replied, "Only once." Bill had so many signs about the garage his action was not surprising. He used signs effectively to supplement the personal point of contact between him and his customers. It was out of the question to talk to each of them as often as Bill had a message to deliver—hence the free use of signs. Every day or so Bill had something he wished to transmit. He talked personally to as many as opportunity allowed and the rest were reached by signs.

"That sign," continued Bill, "solved the tipping problem and, believe me, tipping was an evil that caused me a lot of worry.

The Enduring Foundation

"You see, I hadn't been in the garage business such an awful long while before I discovered that the broad, flat, enduring foundation on which to build a successful business of continually increasing proportions was smiling, prompt, efficient SERVICE and that every customer was entitled to the same consideration in this respect. Whether a man was rich or poor, whether he wore a dirty shirt or a clean one, whether he wanted 5 cents worth of soapstone or $300 worth of tires, whether his purchases per month averaged $1 or $1,000, I concluded that he was entitled to the very best service I could give him and that this applied to all departments, not only to the repairshop, where the term usually is connected with the word free, but also in the accessory store and in the garage.

"I had hardly put this idea into action when I ran against a snag—it was the tipping evil. It was human nature for an employee to accept tips and direct his efforts so that he would get more. Instead of working for me, primarily he was working for tips. Open-handed men received the lion's share of attention, and the man who was close-fisted either through inclination or necessity was badly neglected.

"I determined to eliminate it. Before doing so I looked around and found that other garagemen were suffering but that none had tried to put a stop to it. Furthermore, when I told them what I intended to do they raised their hands in holy horror, said that I could never get away with it, that I could make such a rule all right but that I could not enforce it. They added the instances in any business where such a rule had been enforced successfully were exceedingly discouragingly few, that garage employees were so scattered about the building that it was impossible to make them live up to such a rule, that I would fail and thus be made ridiculous, that where I did succeed in enforcing the rule, I would cause bad feeling and discontent, that finally I would not discharge a valuable employee for such a small offense and that therefore the thing was wholly impossible.

"But I was unconvinced and determined. So I called my men together and explained it to them. I actually got them enthusiastic. I started off by explaining about the foundation of the business being service and how tipping was dead opposed to the working out of this ideal. I promised to raise salaries where necessary and then went on to explain some flagrant instances where tipping had worked out to my harm.

"I told them that a man could not work for two masters and serve both equally well. If I paid them a regular salary and they eked this out with tips from Tom, Dick and Harry it was too much to expect of human nature that when it came to a choice between my interest and that of Tom, Dick or Harry that they would not favor the latter at my expense. And I took pains to remind them that many owners realized this fact and were taking advantage of it.

"I related the case of an owner who used to drive in to the washrack and tell the day man there—he left shortly thereafter—to squirt his hose on the wheels to wash off the dust, and so saying, he would hand the man a half a dollar. The washer would put the money in his pocket and not only hose off the wheels but give the car as much of a wash as he thought he could get away with. That's tipping for you! An extreme case, I'll grant you, but true to principle. I furnished all the washing equipment, including the space, paid the man a salary and yet here was a half dollar that went into his pocket instead of my till. Legalized stealing was all it was.

"That was an extreme case but it did illustrate the principle and all the men seemed to appreciate that.

"Tipping in the accessory store meant that the good tippers got immediate attention no matter how many good cus-

"I had fired my best man—but it proved I meant business"

tomers were slighted and at the risk of losing their trade. Unfortunately, also, there was the temptation to throw something in now and then. I lost a lot of money that way and gave them a few instances.

"In the garage the good tippers received a lot of gratis attention that they really had no right to and worse than that, they would get a half a pint of oil, or a couple of quarts of gasoline for cleaning, and its charging would be forgotten.

"There was one fellow who even saw to it that he rebated the customer twice as much as the tip—this was back in the days before my system was perfected. If a man made $5 worth of purchases and the fellow figured he would get about a 50-cent tip, he would make the charge $4. It was not long before he was discovered, but meanwhile he did a lot of damage.

"The tip-worshipper cannot look out for his employer's best interests. He must do whatever will bring in the tips and where this conflicts with his duty to his employer the latter is simply out of luck.

"As I wound up my talk I could see that I had made a favorable impression on all except two of them. One was the man who did most of the electrical work, and the other was a handy young fellow who did odd jobs around the garage—if he had a speciality, it was pump tending. He did more of that than anything else.

A Smart Aleck

"This young fellow was pretty much of a smart Aleck and evidently was a little amused at my proposal, although he had no idea that I could see it. He held a sort of you-can't-enforce-it attitude—if I want to take a tip, I can. A least that was the way he looked.

"I put the plan into effect immediately and kept my eyes open for surreptitious tipping. The young fellow came strongly under my suspicion two or three times, but before I got any real evidence against him I discharged him on the advice of his foreman for complete incompetence. He was the sort of young fellow you would expect to break the rule whether he did or not. He did not have sense enough to appreciate I was dead in earnest about this thing and would have fired him quick as a wink if I had caught him.

"The electrical man, on the other hand, was one of the best we had around the place. He knew a lot about the eccentricities of starting, lighting and ignition systems and had an uncanny power in divining just where the trouble was and how to fix it. When I put through the no-tipping rule I raised his salary substantially because I knew he had been making a lot of money from grateful customers whose troubles he had cured with surprising dispatch.

"One day I caught him red-handed accepting a tip. He turned scarlet and walked away quickly. I said nothing. He continued his work and evidently felt his indispensability made his tenure secure.

"That night, as he was leaving the garage, one of my clerks handed him an envelope with his pay and notice of discharge. That was all there was to it.

"It proved to any of the rest that I meant business. Most of the men did not need this proof, for they knew me well enough to be quite certain that I would stick to my word always, but if there were any waverers, that incident cured them, for I had fired my best man.

"Every time I have hired a man since adopting the no-tipping rule, I lecture him on the idea, and the impression this makes in addition to the general feeling against tipping I have gradually ingrained into my employees keeps him out of temptation.

"That sign over there is not a warning to employees, because they already have been warned adequately, but it is a notice to owners that tipping is not allowed. When a new customer comes in here he sees that sign and usually he does not try to tip. The sign alone convinces him. This saves time, for if he offers a man a tip the latter has to explain that he cannot take it, and besides there is a slight element of temptation which the sign helps to avoid.

"The first step up the ladder of perfect service is the elimination of the tipping evil," concluded Bill.

The Right Kind of Service for the Tractor

DES MOINES, Iowa, April 4—What service will do, the right kind of service, in making a tractor worth while, is illustrated by a case at Pella, Iowa, this last year. Because the dealer was on the job and kept a tractor fit for work a farmer was enabled to do two years' work in one. The story is this:

The Pella Motor Co. handles the Moline-Universal tractor. Last year witnessed the start of the company in the tractor business. Not many were sold during the first year, just a half dozen or so. The company really knew very little about the tractor business in general, and practically nothing about the Moline-Universal in particular.

However, the company had been engaged in the motor car business successfully for several years and had built up and equipped a service shop far more elaborate and better than usually is found in a town as small as Pella. In fact, the company prided itself upon the kind of service it could and did give. It was its pet. As far as motor cars were concerned it never found anything in the service line it was afraid to tackle and it always got away with what it did undertake. The tractor business was undertaken then in the calm assurance that anything that came up would and should be met successfully.

The company, too, prides itself upon being sufficient unto itself in all service stunts. It was somewhat of a surprise, then, when the utmost resources of the firm fell down on one of the tractors and, unfortunately, on one of the first ones sold. The company met every emergency on all the others, but this one was baffling. Apparently it was not right in any way. Everything went wrong. There was trouble, first, last and all the time. Nevertheless, that tractor, like all the others, had been sold on the firm's guaranty that it would work satisfactorily, and the company was determined to make good. For almost the first time in the history of the company an appeal was made to the factory and an expert called. He came and corrected the worst of the trouble and left the company to its own devices.

Trouble continued. The farmer was depending on his machine. Practically, the company sat up with that tractor and nursed it. Pretty nearly it got the company's goat. But perseverance and prompt attention to every call, no matter at what inconvenience or cost, kept that one troublesome machine at work. And this is the result:

It plowed the whole farm. It harrowed and fitted the seed bed. It cultivated the corn. Then, just about when it normally might have ceased from its labors for the year, a hailstorm came along and ruined the crop. Nothing daunted, the tractor replowed the farm, seeded it to a fall crop and harvested that crop—thus doing two years' work in one on that farm. But it made the Pella Motor Co. sweat blood to do it.

To-day that tractor has been tinkered with and fixed up and serviced until it is as good as any tractor Moline ever sent out. Its owner, too, despite all the trouble, disappointment and annoyance he experienced originally, is enthusiastic for it and swears by it, and also he swears by the kind of attention he got from the Pella Motor Co.

JOLIET TRACTOR CHANGES NAME

Joliet, Ill., April 7—Henceforth the Joliet Oil Tractor Co. and the Bates Machine Co. will be known as the Bates Machine & Tractor Co. Since 1883 the Bates Machine Co. has been builders of Corliss engines, powerplants and special machinery. Seven years ago the company began the construction of the Bates Steel Mule under the name of Joliet Oil Tractor Co. An amalgamation under the name Bates Machine & Tractor Co. has been made. No change has been made in the personnel.

PAN MEN RE-INDICTED

Chicago, April 5—The Federal grand jury has reindicted the thirteen members of the Pan Motor Co. on a charge of using the mails to defraud. Samuel C. Pandolfo, president, is charged with receiving $5 of every $10 share sold. The first indictment was reported in the issue of Feb. 6.

EXPECTED SAMSON PRODUCTION

Detroit, April 4—It is stated at General Motors headquarters here the Samson Tractor Co., Janesville, Wis., will begin operations in three weeks and that by July 1 approximately 1850 model M tractors will have been completed and shipped from its factory. It is expected by that time the company will be producing thirty machines daily.

Garage Planning
Service Station Arrangements

No. 31

Q —I am attaching sketch showing size of plot and location on which I except to build my new garage. The plot is 100 by 150 ft. and is to have a two-story fireproof structure. The front is to face on Market street, which is our main street. The front part of the lower building will be rented to car agencies, and the balance of the building will be used for storage purposes. There will be a repair department on the second floor, which will employ about six men.

I should like to know about the use of an elevator or a cement drive to the second floor at the rear of the building. The material to be used in the building will be brick for the walls, with cement floors and steel.—E. H. Dorsey, Lima, Ohio.

This plan has three showrooms 33 by 70 ft., an accessory store and stockroom, ramp instead of an elevator and a repairshop on the second floor.

No details are given regarding offices in the showrooms as it is believed that each occupant will want to follow his own ideas. In any case wood and glass partitions should be used.

You did not request an accessory store, but when we came to lay out the garage space we found there was some space that could not be utilized very well in any other way, and as we think you are planning to push accessory sales once you are installed in your new building, we thought it wise to include a small store and stockroom. The garage office is placed under the ramp. If the headroom allowed is not deemed sufficient, then the floor of the office should be depressed a foot or so.

If you find the shop not large enough, it is an easy matter to extend it to the right as much as desired.

It should be plain that cars in row A on the second floor should be machines which go out early, thus allowing machines in row B and row C to get out. The cars in the latter two rows obviously should be ones which go out later than those in row A.

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repairshop.

And how much of an accessory department is anticipated.

No. 32

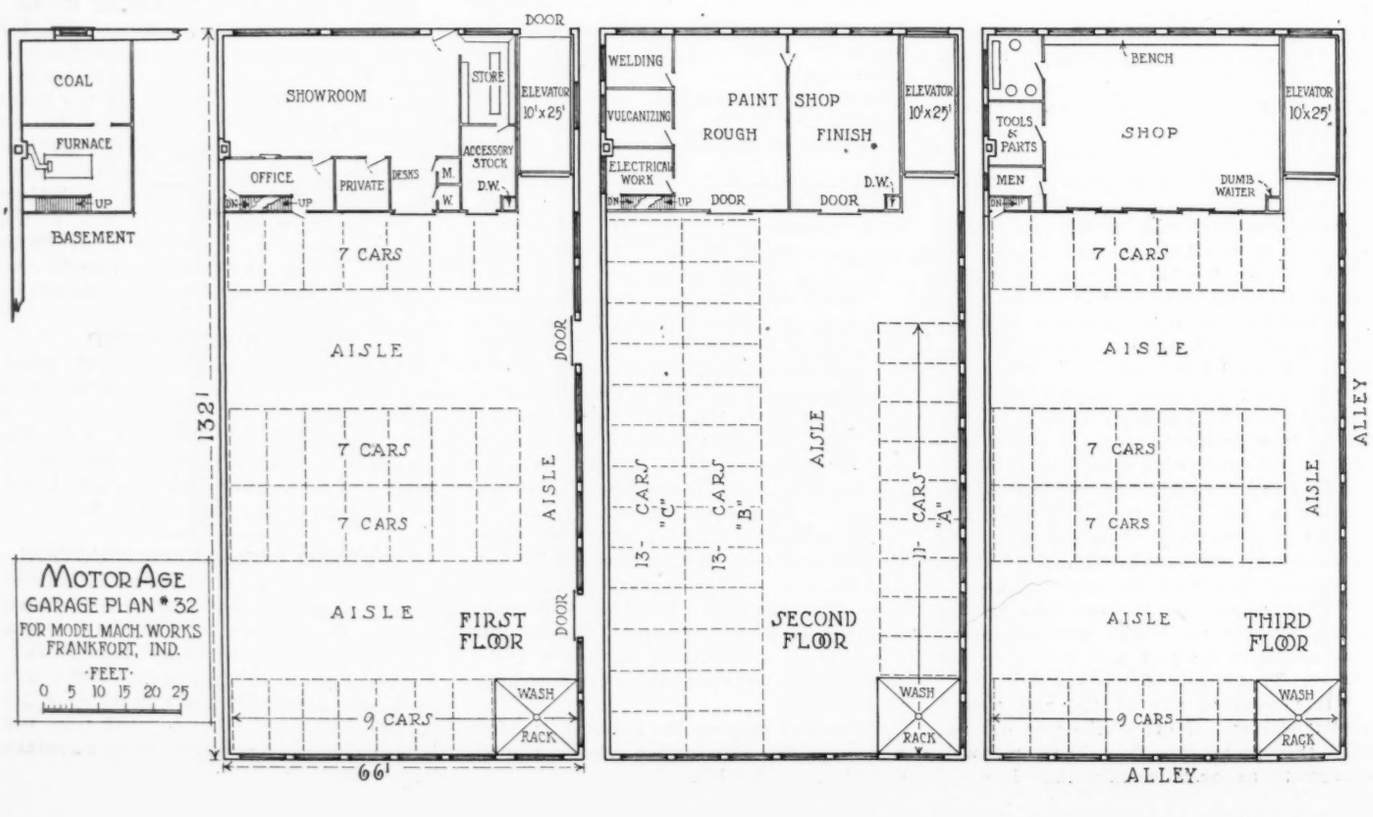
Q—We are going to erect a new garage building this spring and would like suggestions for a three-story, concrete, fireproof building, 66 by 132 ft. It will face the street on the south, with alleys to the west and north. We will use 32 ft. across the front of building for the showroom, office and accessory stock. The remainder of the first floor, the second and third floors will be used for storage.

We want to equip the building with an elevator of sufficient capacity to carry trucks and cars to second and third floors, as we will have repairshop and paint shop on the second or third floor, provided the state fire marshal will permit us to put the repairshop above the first floor.—Model Machine Works, Frankfort, Ind.

You give us so few details that the plan we have drawn, at least as far as dimensions of department rooms are concerned, suits an average case and therefore may not be exactly what you want. If not, we shall be glad to change it to suit.

You did not request an accessory store, but we presume you want one, as you probably realize a store is just as essential to the full success of the accessory end of your business as a showroom is to the car sales end. If you question this statement, please ask us to go into it more deeply.

Many dealers are beginning to realize there is a lot of money to be made in accessories. Remember, that the average owner spends as much money on accessories and supplies, including gasoline, as he does on his car. In the course of two or three years he will spend as much in the upkeep of the car as the car cost orig-



inally. Hence, the necessity of pushing accessory sales.

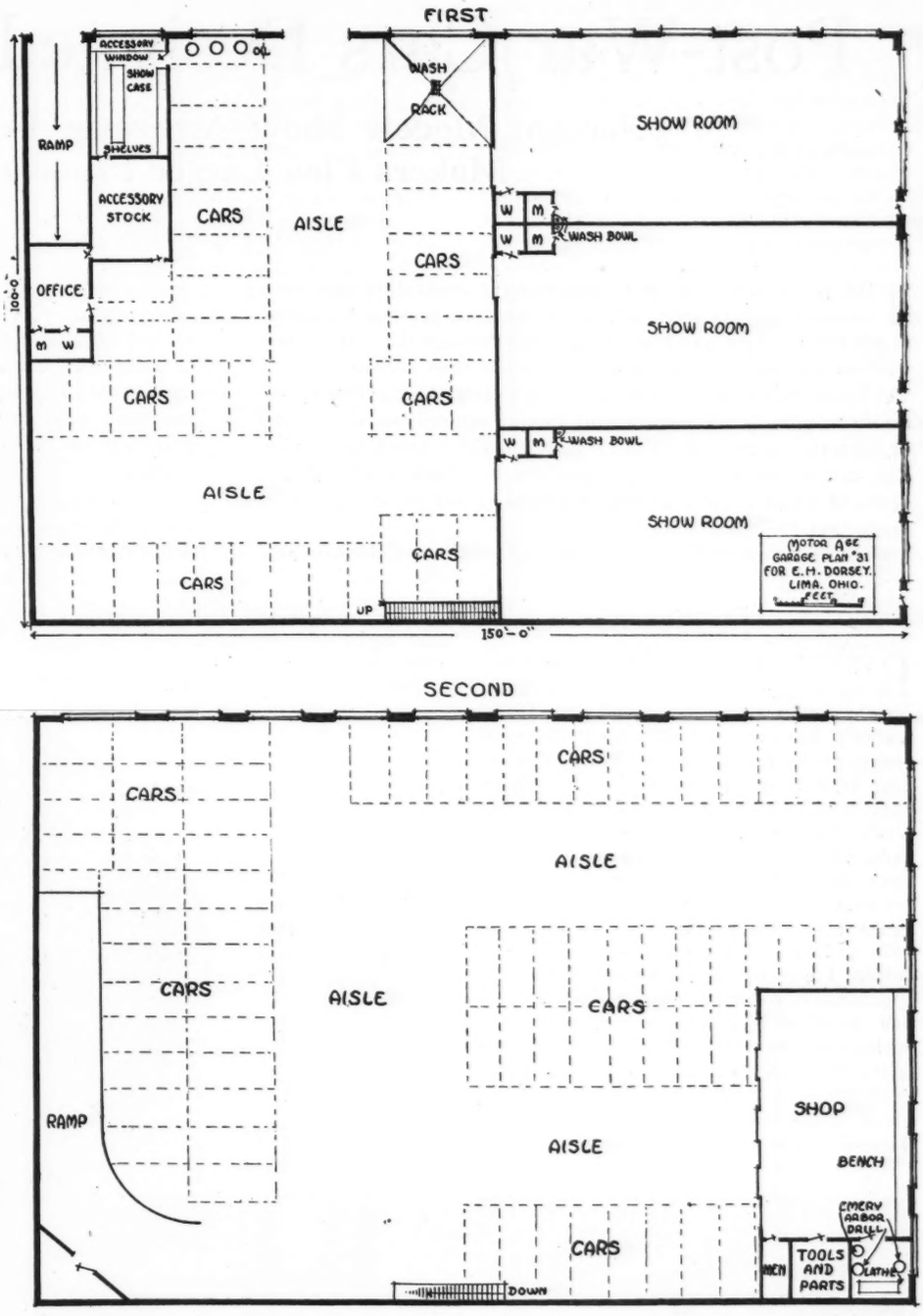
Inasmuch as there is room to spare on the second floor where the paint shop is, we use part of this space for three departments, welding, electrical work and vulcanizing.

The usual size for an elevator platform is 10 by 20 ft., but we have made yours 10 by 25 ft., because the layout of the building is such no extra space is required and the larger platform is always an advantage.

A dumbwaiter connects the accessory stockroom with the paint shop and the repairshop.

The car arrangement shown on the second floor is recommended for the first and third floors also because it provides for the storage of thirty-seven cars as against thirty on either of the other floors. Furthermore, it is almost necessary to use this arrangement on the first two floors, at least, since the arrangement shown on the ground and top floors is likely to be hampered by the placing of the posts. Inasmuch as there will be no posts to support the roof, either method may be used on the top.

If you are not familiar with the arrangement shown on the second, it should be explained that it has been used by various garagemen all over the country and when properly used has no disadvantages. Cars in row B should be ones which leave early in the morning and come in late at night; cars in row A should be ones which leave late in the morning and come in early; and those in row A should be made up of cars which cannot be placed in B or C.



MOTOR-DRIVEN STREET CAR

Detroit, April 4—Henry Ford and the engineers of his tractor organization are working on plans for a streetcar driven by an internal combustion engine. A machine is under construction and will be demonstrated in Detroit this summer.

Lieut.-Col. E. J. Hall, one of the designers of the Liberty engine will come to Detroit to assist in the demonstration of the new car. Colonel Hall has already successfully worked out motor-driven streetcars but will co-operate with Mr. Ford in perfecting the latter's new idea.

WILLYS STARTS PROFIT-SHARING

Toledo, Ohio, April 7—Willys-Overland has approved two sections of the profit-sharing plan under which it proposes to operate. The two sections were completed by the factory committee of ten.

Profits to be shared with the employees will be distributed five times anually: In April for January, February and March; in July for April, May and June; in October for July, August and September; in December for October and November.

The other section requires that an employee, to become a profit sharer, must have been six months in continuous service. Absence from work because of sickness, injury or on consent of employer, does not affect his continuity of service. Absence, however, without report or satisfactory excuse, automatically removes the employee from the continuous service record. Overland men still in military service will be considered as still in continuous service if they make prompt application for re-employment after their discharge from military service.

CHANGES IN MOTOR LIFE

New York, April 8—C. B. Ames, business manager; C. G. Sinsabaugh, editor; A. B. Hunt, southern advertising manager, and W. W. Sheppard, western advertising manager, of Motor, have resigned to become associated in similar capacities with Motor Life.

Mr. Sinsabaugh was with Motor for four years, and previous to that editor of Motor Age. Hunt, Ames and Sheppard were identified with Motor for approximately twelve years. A. J. Stocker, for many years with Automobile Blue Books, becomes middle western advertising manager of Motor Life. All five will be engaged to some extent in work on the Automobile Blue Books as well. Monte W. Sohn, former editor of Motor Life, leaves that post to assume the post of director of research and publicity for Motor Life, Automobile Blue Books and Automobile Trade Directory. Leslie V. Spencer, formerly with the Bureau of Aircraft Production and before that on the editorial staff of the Class Journal Co., becomes assistant to Mr. Sinsabaugh.

FORDSON DEALERS MEET

Chicago, April 8—Fordson tractor dealers in the territory controlled by the Rue Motor Co. of this city have evolved a plan whereby no tractor is to be idle for more than 24 hr. Dealers plan to keep on hand enough stock so if necessary they can replace the whole tractor while the broken one is being repaired. Power farming requirements were analyzed for the 200 dealers in convention here from northern Illinois and northern Indiana. A. E. Hildebrand addressed the dealers at a banquet Monday evening.

Post-War Cars Designed by Europe

Foreign Models Show American Features and Makers Plan Larger Production

By W. F. Bradley

THE plans of Europe as to post-war car production have been awaited with interest, but it has not been possible heretofore to get much insight into such plans, partly because the change from wartime to peace production in Europe has been necessarily slow. The Lyons fair in France offers what is practically the first opportunity to gage future activities of foreign car producers. Perusal of the automotive exhibits there show a decided trend among foreign car makers toward bigger production. There is also an evidence of adoption of American practices in design, as well as in production and sales.

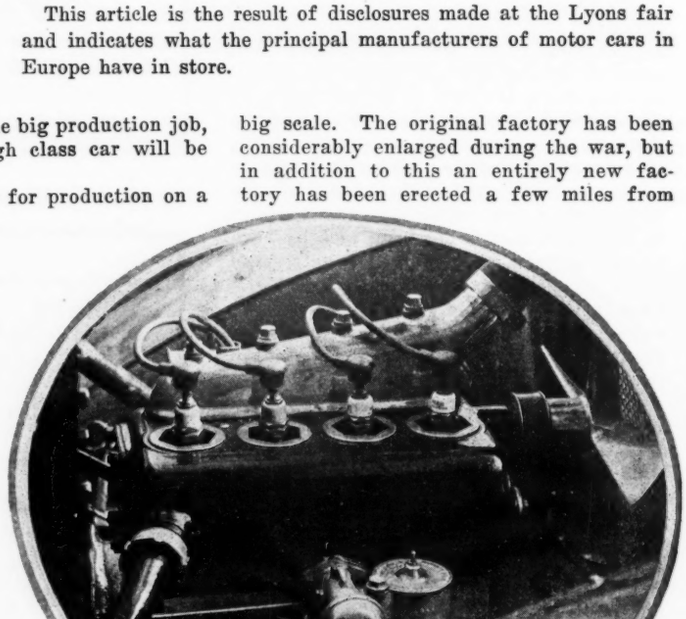
Huge war expansion has furnished the facilities for quantity production in Europe, and it would be strange were this not taken advantage of. As matters now stand the import of cars is prohibited altogether by France. It is reported the recent congress of inter-allied car manufacturers reached a decision to place an import duty of 45 per cent on American cars and 10 per cent on European cars. All of which points the way toward bigger production in the European factories, as well as protection of the home market.

This article is the result of disclosures made at the Lyons fair and indicates what the principal manufacturers of motor cars in Europe have in store.

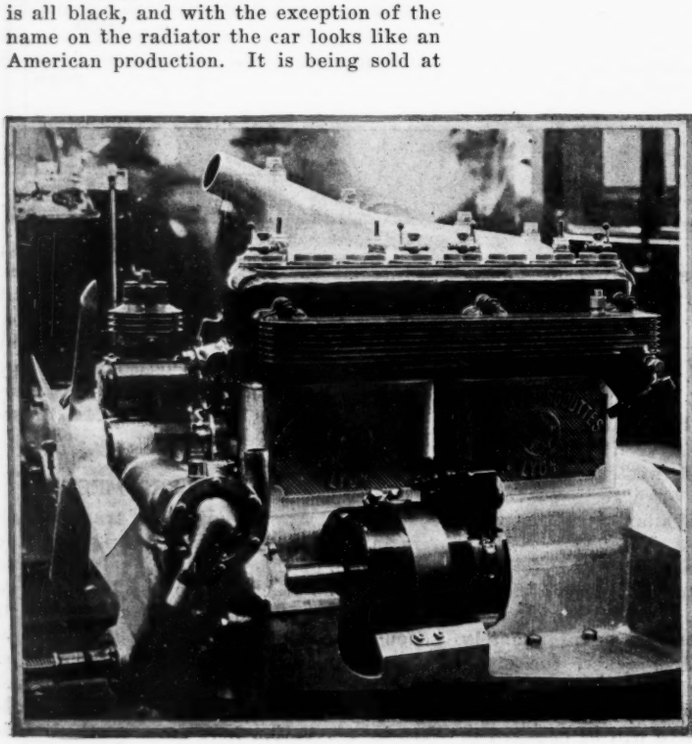
Berliet

BERLIET, who is the most important motor car manufacturer in the Lyons district, with a factory employing 10,000 workers, has come out with a new five-passenger entirely on American lines. The engine is a four-cylinder of 3½ by 5½-in. bore and stroke with detachable head, North East generator and starter, Berliet carbureter and a French magneto. It has cone clutch, three-speed gearset with center control, left-hand steering, spiral bevel gears with Timken bearings in the rear axle and is sold complete with all accessories, including an American horn and speedometer. Where it departs from American practice is in the use of cantilever springs at the rear and steel disk wheels with detachable clincher rims. The finish is all black, and with the exception of the name on the radiator the car looks like an American production. It is being sold at $2,350. This will be the big production job, and in addition a high class car will be marketed.

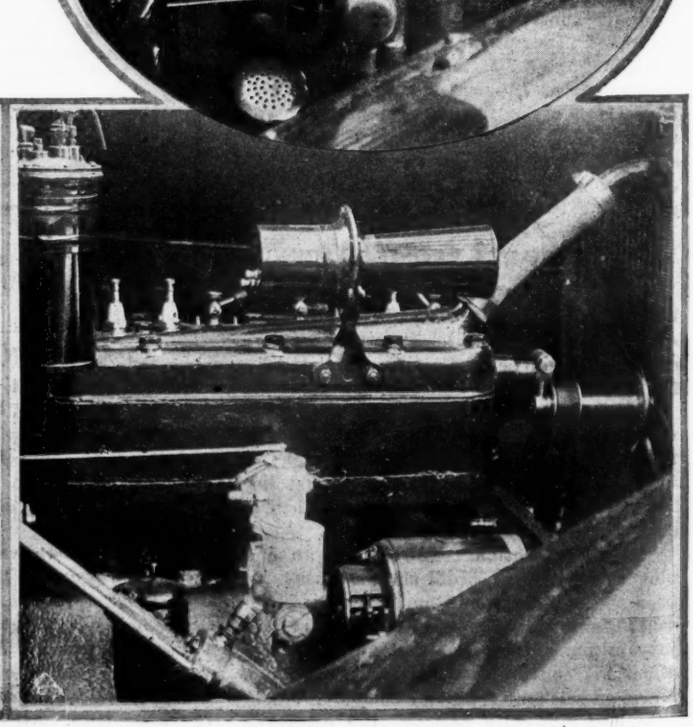
Berliet has capacity for production on a big scale. The original factory has been considerably enlarged during the war, but in addition to this an entirely new factory has been erected a few miles from



The Peugeot engine, showing cast-in manifold among other features



Note the cross-shaft which drives the generator, fan and pump on this Cottin-Desgouttes engine



Berliet is making a five-passenger on entirely American lines. Note the vacuum feed tank

Lyons, where the whole staff of 10,000 could be employed. The works are absolutely up to date and fitted with the most modern machinery. During the war Berliet produced twenty-five trucks a day, in addition to 250 tanks of the Renault type every month, also shells and machine guns.

Peugeot

Peugeot has one of its new models ready, a light four-cylinder four-passenger, evidently designed for cheap production. The selling price was not announced at the show. The engine has its cylinders of 66 by 105-mm. cast with the upper half of the crankcase, while the crankshaft is carried in two ball bearings. Valves are on one side with a single cap for each pair. The carbureter, a Zenith horizontal, is bolted up direct on the valve side, and the exhaust manifold is cast with the cylinders. A single chain, placed at the rear, drives the camshaft and the magneto and electric generator shaft, while provision is provided for taking up slack by an idler pinion mounted eccentrically, with a lever on the outside of the casing for moving it and locking it in position. The electric generator is just ahead of the timing gear housing, and the magneto on the same shaft as the generator. The starting motor is placed down on the right side of the engine.

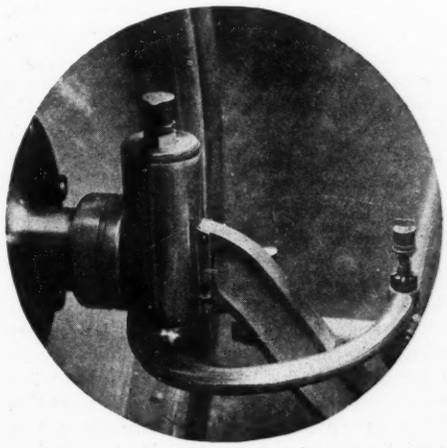
This engine forms a unit construction with the clutch and gearset, the former being disk type and the latter giving four speeds ahead and reverse, with center control. Steering is on the left side and is of worm and nut type. Cooling is by thermosyphon, with the fan driven by belt off the crankshaft. It is not known whether the French S. E. V. lighting set or the American Bijur will be used. Peugeot has adopted final drive by underneath worm, the final gear ratio being 4.6 to 1, with which the car has a speed of 36 m.p.h. Cantilever suspension is fitted at the rear with semi-elliptic in front. Wheels are wood detachable with 710 by 90-mm. tires. Gas consumption is stated to be 24 to 25 m.p.g.

Peugeot also will get into big production at an early date. It is running ten distinct factories. At Beaulieu it has two for bicycles, motorcycles and light cars; at Mandeure it will build bodies only; cars will be built at the Audincourt factory; at Sochaux two factories will be devoted to trucks, tractors and steel, iron, bronze and aluminum castings; all the forges are at Montbeliard; at Lille there is a special factory for bolts and nuts and general turning; at Issy-les-Moulineaux, near Paris, the company will produce aviation engines and spare parts; and at Levallois-Perret, near Paris, will be the central repair establishment and store rooms for spare parts.

In addition to its light car of 10 hp. Peugeot will put on the market a 12-hp. medium four-cylinder, five-passenger and a high class six-cylinder valveless seven-passenger.

Fiat

Fiat's first post-war model to be offered to the public is a high class light car with four-cylinder engine of 2.5 by 4.3-in. bore and stroke developing 23 hp. at its maximum speed of 2800. It is believed that this type of car will meet European conditions, where cost of maintenance has to be considered closely. So much more attention has been paid to workmanship and detail finish on the Fiat that it is interesting to know how it will compare in the matter of price with its French rivals. Up to the present the Fiat has not made any announcement of price, stating this cannot be settled until import duties are known.



Steering pivots with dust guards on the Rochet-Schneider car

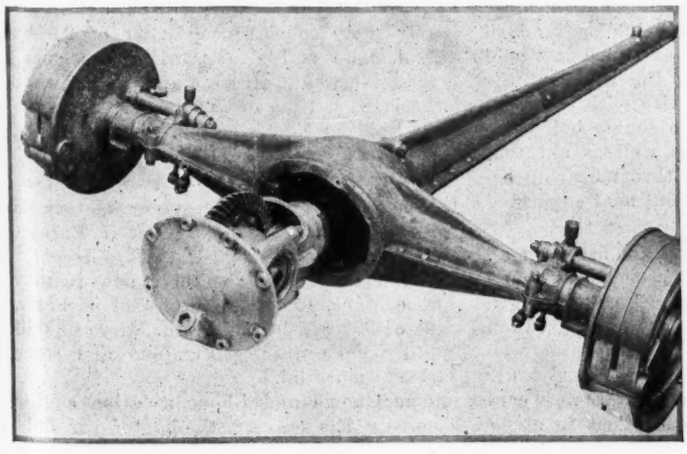
Technically the Fiat engineers have made several changes. The use of detachable cylinder heads is new. Electric generator and starting motor are both cylindrical and carried in cylindrical extensions of the crankcase. The engine and gearbox form a unit with three-point attachment to the frame, and the housing which carries the clutch and gears also acts as an oil reservoir for the universal. The rear axle and propeller shaft housing is composed of two steel stampings welded together in a horizontal plane, with a cover plate on the rear of the differential housing allowing the whole differential and propeller shaft to be withdrawn. Spiral bevel gears are used. The two sets of brakes are side by side on the rear wheels, which are detachable steel-spoke type. Pressure fed gasoline has given way to a dashboard tank. Right-hand steering is maintained, but the change speed and the brake levers are inside the body and independent of the frame.

Fiat has easily the biggest car factory in Europe, with 40,000 on the payroll. During the war the factory was producing 100 trucks and cars a day, in addition to aviation engines, guns and special military material. Very close attention has been paid to export business, and production methods have been closely studied. Fiat now has in America a commission composed of one of its chief engineers and several heads of departments. Fiat's program is two fours and two sixes, and although these are going to be high class jobs, the factory is of such a size that it must produce on a big scale.

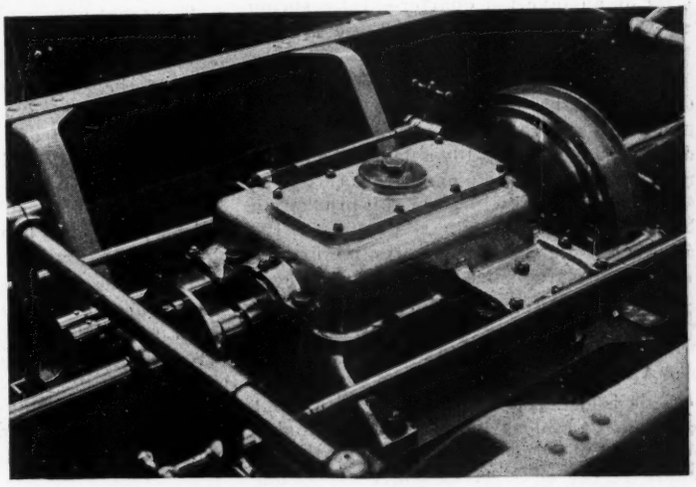
Car at $950

The cheapest car in the show, and in fact the lowest-priced car ever offered in France, is the A. S. S., complete at $950 with four-passenger body, electric lighting and starting, detachable steel disk wheels and all accessories. On this price it was declared that a reduction of $20 would be made if orders for 1000 were received before the end of March, and a further reduction if 10,000 are ordered before the end of the year.

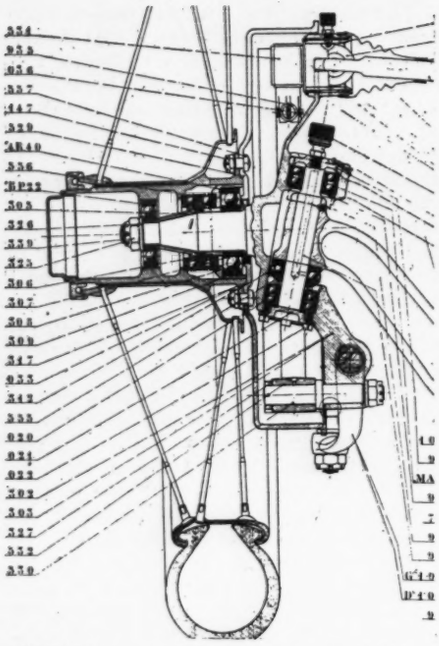
The company responsible for this car constructed airplanes during the war and is transforming the airplane factory into a car establishment. Nothing more than a sheet metal body with four detachable



The new Fiat rear axle with Gleanson gears



Only the Rochet-Schneider had the gearbox thus



The Delage employs an offset spindle on the front wheel

seats was on view, it being declared the complete chassis would be ready before the close of the fair. While there was a reluctance to give many technical details, it was learned that the engine will be a two-cylinder two-cycle of 2.9 by 4.7-in. bore and stroke. A two-speed epicyclic gear is used and Ford-type steering. Springs are semi-elliptic in front and cantilever at the rear. Extensive use is made of pressed steel. Not only the frame members but the two axles are of this construction. Interchangeable steel disk wheels are used with detachable clincher rims and tires of 765 by 105 mm. The wheelbase is 112 in., and maximum speed 42 m. p. h., with a claimed gasoline consumption of 25 m.p.g.

Citroen

Citroen, who during the war was the biggest shell producer in France, is putting on the market a $1,470 light four-cylinder, two- or four-passenger with an engine of 2.5 by 3.9-in. bore and stroke. The feature of this is the suspension, which consists of an inverted quarter-elliptic spring above and below the axle, these springs taking the drive and torque.

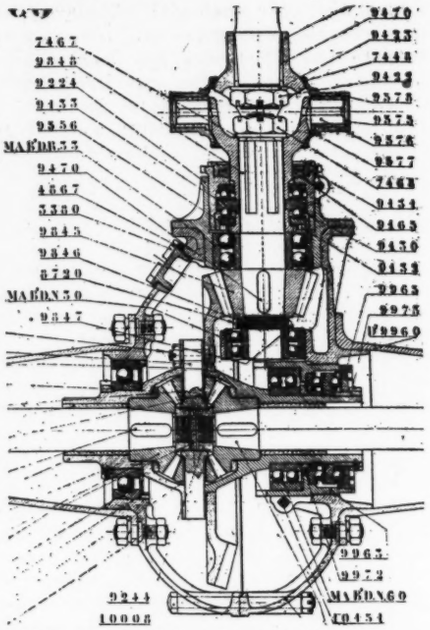
Within three months of the armistice Citroen had his new car ready and within five months of the armistice he will be producing at the rate of 100 a day. Though he never built a complete car before this year, Citroën claims he will be in full production before the end of April. His figures of 100 a day astounds the trade, for no firm in France, or Europe, has risen to such an output. He is showing his advance models everywhere, establishing service stations throughout France and promising deliveries for April.

This is decidedly a light car with a lot of American ideas in it. The detachable cylinder head has been adopted, partly because of the ease for carbon removal but more for ease of production. Left hand steering with central control has been decided on entirely for simplicity in construction and assembly.

Although the engine, clutch and gearbox form a unit, Citroen has not adopted the American method of casting cylinder and upper portion of crankcase in one. The cylinder block is mounted on an aluminum base chamber divided horizontally, the lower portion forming the oil pan. The clutch housing and gearbox are a separate aluminum casting bolted up to the engine casting, the unit thus formed being attached in the frame by three points.

Provision has been made for the withdrawal of the entire powerplant without disturbing any portion of the body. There is no great departure from standard practice in the engine. There is no fan, although a fan bracket is carried in case it should be necessary to use a fan in tropical countries. The engine is claimed to develop 18 hp. at a maximum speed of 2100 r.p.m.

A Solex carbureter is fitted. Hotchkiss drive has been adopted, and Michelin steel disk wheels are standard. A speed of 40 m.p.h. is claimed with a fuel consumption of 31 m.p.g.



Note the ball bearings in the rear axle on Delage

Delage

Delage has stepped right out of the small and medium-priced car into the big luxury type with a six-cylinder of 3.1 by 5.9-in. bore and stroke. This is listed at $5,700 complete with five wire wheels and tires, lighting and starting. It is rated at 24 hp. but develops 70 hp. at 2000. The engine forms a unit construction with clutch and gearbox and is carried in a chassis of 135-in. wheelbase. It is an L-head type with layout designed to give complete accessibility. Two Zenith carbureters fed by the vacuum system are used.

Delage has been a partisan of Hotchkiss drive and has maintained it in this model with, of course, a universal joint at each end of the propeller shaft. The rear axle is full floating with a wealth of ball bearings both for the driving couple and the differential shafts. Except that final drive is by Gleanson gears, this rear axle does not differ in any essential feature from the special axles used on the Delage racing cars. The rear springs are underslung and three-quarter elliptic.

The front axle is also the outcome of racing experience. The steering knuckles are castor type, the pivots being so inclined that if their axis were extended it would cut the vertical axis of the wheel at the point of contact of the tire with the road. The steering pivots have double ball bearings top and bottom, as well as a thrust bearings, with a double thrust bearing between two. This is a refinement suggested by racing experience.

Interchangeable brakes are fitted on all four wheels. The front wheel brakes are built under Perrot license, Perrot being a French engineer who first specialized on front wheel brakes and secured patents on many of their details. Delage used these brakes for two years on his racing cars and was so satisfied he decided to apply them to his touring models. The four brakes are operated together by the pedal and at a speed of 60 m.p.h. can bring the car to a standstill in 100 yd. This means that 60 m.p.h. is a safe speed as long as the driver has an open stretch of 120 yd. ahead of him. A hand brake is fitted on the transmission.

The speed of the six-cylinder Delage with full touring equipment is easily 70 m.p.h. With closed body the car can do 65 m.p.h. Fuel consumption is 14 m.p.g. During the war it has been necessary to make frequent trips from Paris to Grenoble, 360 miles. Driving fast, it was found an average speed of 43 m.p.h. could be made, including all roadside stops, with a fuel consumption of 11.2 m.p.g. Fixing the maximum speed at 47 m.p.h., the average worked out at 37 m.p.h. and fuel consumption at 14 m.p.g. This indicates rapid pick-up and high speed on the hills, for a portion of this road is through a mountainous district.

Delage is building this chassis in three wheelbases, 132, 136 and 145 in., to take a runabout, a touring body and a large closed body. Detachable Rudge-Whitworth wheels are standard.

Renault

Next October Renault will put out an entirely new model four-cylinder of 2.9 by 4.7-in. bore and stroke, with three-speed gearset, left hand steering, detachable wood wheels with tires of 760 by 90 mm., electric lighting and starting. The price of this chassis will be $1,350 complete with everything except lamps.

Renault has the biggest car factory in France, and the second biggest in Europe, the regular staff being 25,000. Recently Renault has laid plans for a new factory at Le Mans, 150 miles southwest of Paris, where 5000 will be employed. Here he will build trucks, tractors, trailers and some railroad material.

The Gnome and Rhone aviation engine company has entered the motor car field and will build Piccard-Pictet cars under license in their two factories near Paris. The models to be produced are a 10-hp. and

a 14-hp., four-cylinder, as well as a 28-hp. eight-cylinder. All three are to be equipped with electric lighting and starting, mechanical tire pump, speed indicator and accessories. It is understood the size of the eight-cylinder will be 85 by 130-mm. bore and stroke and it will be fitted with front wheel brakes. At the Lyons fair the Piccard-Pictet company exhibited the Argyll type of single-sleeve-valve engine.

Trend of Design

While the number of entirely new cars on exhibition is small, plenty of information was available at Lyons regarding the immediate program of car concerns and the general tendency of design. There is undoubtedly a great demand in France for what may be termed a European Ford, that is, a car as near as possible to the Ford price, carrying four passengers comfortably but having a better appearance and a lower fuel consumption than the Ford. There is no such car on the market or clearly in view. The tendency has been toward a small, light car, of the Citroen type, which is very satisfactory as a two-seater, but not so suitable with a four-seater body.

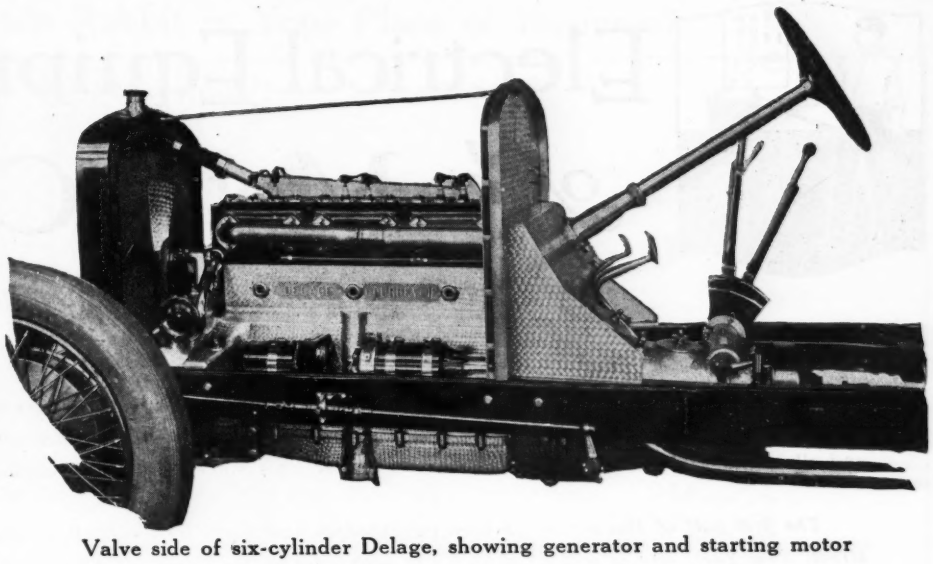
It looks as if the new Peugeot will get very near this class, for one of the Peugeot factories will be given over entirely to the production of this car, and it is evident the design has been worked out with a view to low production costs. Lorraine-Dietrich, who has specialized on aviation engines during the war, will produce two six-cylinder cars and one twelve, but all are high-class jobs.

The general tendency of European construction is now very clearly defined. The four-cylinder is holding its own, but for high-class jobs the six will predominate. Eights will come next in line, with twelves last on the list. Up to the present only one eight has been produced commercially in France, this being the original De Dion Bouton. In addition to the Gnome eight, it is very probable an eight-cylinder will be brought out by Darracq.

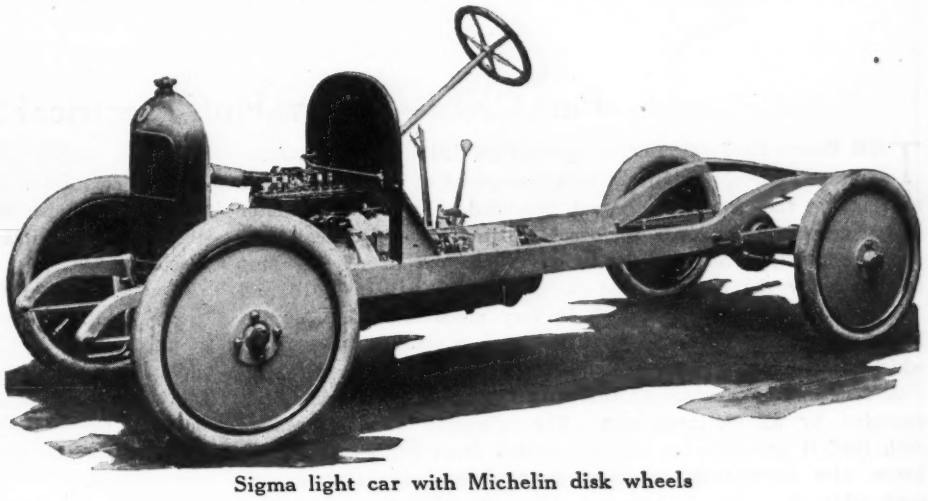
Detachable cylinder heads are making their appearance slowly but will certainly become more popular during the next twelve months. Fiat was the first to make a decided move in this direction, adopting detachable heads for all models. As Fiat has always been very proud of the cleanness of its design and has never made a mechanical change without long preliminary tests, it is certain this example will be followed.

The tendency to drop the magneto and rely on the batteries for ignition is being manifested slowly. Engineers, particularly those who have an eye to low cost of production, are convinced of its soundness, but the sales organizations are rather afraid of offending the public, which has been educated to believe the only reliable ignition is by high-tension magneto. Nevertheless, some high class cars to be shown at the Paris salon next October will be minus a magneto.

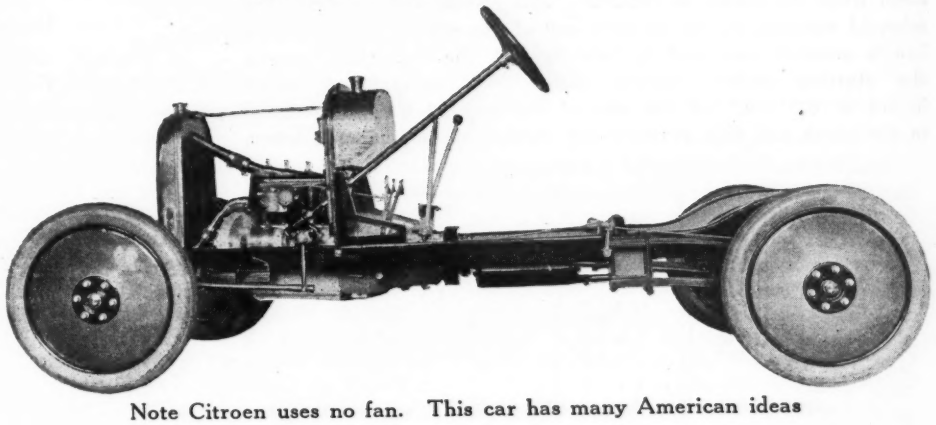
The L-head engine holds its own without any difficulty. The most popular method of driving the pump and the magneto is by a transverse shaft. This is found on all the Fiats, the new Delage, the new Cottin-Desgouttes, the Renault.



Valve side of six-cylinder Delage, showing generator and starting motor



Sigma light car with Michelin disk wheels



Note Citroen uses no fan. This car has many American ideas

The practice of placing the radiator back of the engine has lost ground. Th. Schneider and Charron, who, before the war, had radiators at the rear, have dropped this position for the more conventional one in front. Renault is now practically alone in this style of construction.

On the new Cottin-Descouttes engines the transverse shaft drives not only the magneto and water pump at each end but the fan and a two-cylinder tire pump. This is one of the few cars fitted with a power inflator.

The tendency every where is to bolt carbureters direct to the cylinder casting on the side opposite to the valves and to feed gasoline to the carbureter by the vacuum system. The pressure system has practically gone out of existence, while gravity feed is only being used for small cars where a tank on the dashboard is not of sufficient size to cause any inconvenience.

Left steering with center control is coming along. Renault is going to adopt it for his new popular model. Citroen has already adopted it. The real objection now is that left hand steering will not be accepted by English buyers, and as there is little possibility of convincing the English nation of the advisability of changing its singular rule of the road to that of the rest of the world, French firms who count on selling cars in England keep to right hand steering so as not to have two different types.

Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.

Editor's Note—Herewith is presented the 141st installment of a weekly series of articles begun in MOTOR AGE, *issue of June 29, 1916, designed to give the repairman and motorist the knowledge which will enable them to care for and repair any and all of the electrical features of the car, no matter what make or model it may be.*

The first half of this series has been published in book form by the U. P. C. Book Co., Inc., 243-249 West Thirty-ninth street, New York, and is sold at $2.50. The remainder of the series will be published as a supplementary volume.

Part CXLI—Simms-Huff Electrical Systems

THE Simms-Huff electrical equipment on 1918 cars is a single-voltage system, the battery being composed of six cells in series and having the negative terminal grounded. The starting motor and generator actions are performed by the same electrical unit, and the construction and regulation of the output of this unit is practically the same as the one used on the 1915, 1916 and 1917 cars. The starting switch is very much simplified, and it has only two contacts. The starting switch is operated by a pedal which also serves to throw the starting gears into mesh.

A very unusual feature of this starting switch is a special lock operated by an electromagnet. The operation of this lock is such that it prevents the starting switch from being closed and, hence, also prevents the starting gears from being thrown into mesh while the engine is running . This special lock consists of a solenoid mounted on the forward end of the switch. The solenoid has a movable core and is held against the rod which carries the starting switch contact piece by a spring. A notch is cut in the rod, and the end of the core of the solenoid fits in the notch and thus prevents any motion of the rod and, hence, holds the switch open. The circuit through the solenoid, in starting, is completed by pressing a button on the heelboard beside the driver, which draws the core away from the rod and allows the starting switch to be closed and the starting gears to be meshed.

The winding of the solenoid is short-circuited when the cutout closes, and it is impossible to operate the starting switch after it is released. It is impossible to operate the solenoid even if the cutout opens and the engine continues to run, as the voltage applied to the solenoid winding when the cutout is open is the difference between the battery voltage and the voltage generated in the armature of the electrical unit, which is usually too small to energise the solenoid.

Installation on 1917 Maxwell

A two-unit, single-wire, 6- and 12-volt system is used on the 1917 Maxwell. A wiring diagram showing all the various internal connections is given in Fig. 698. The ignition, starting, and charging circuits may be traced by following this diagram.

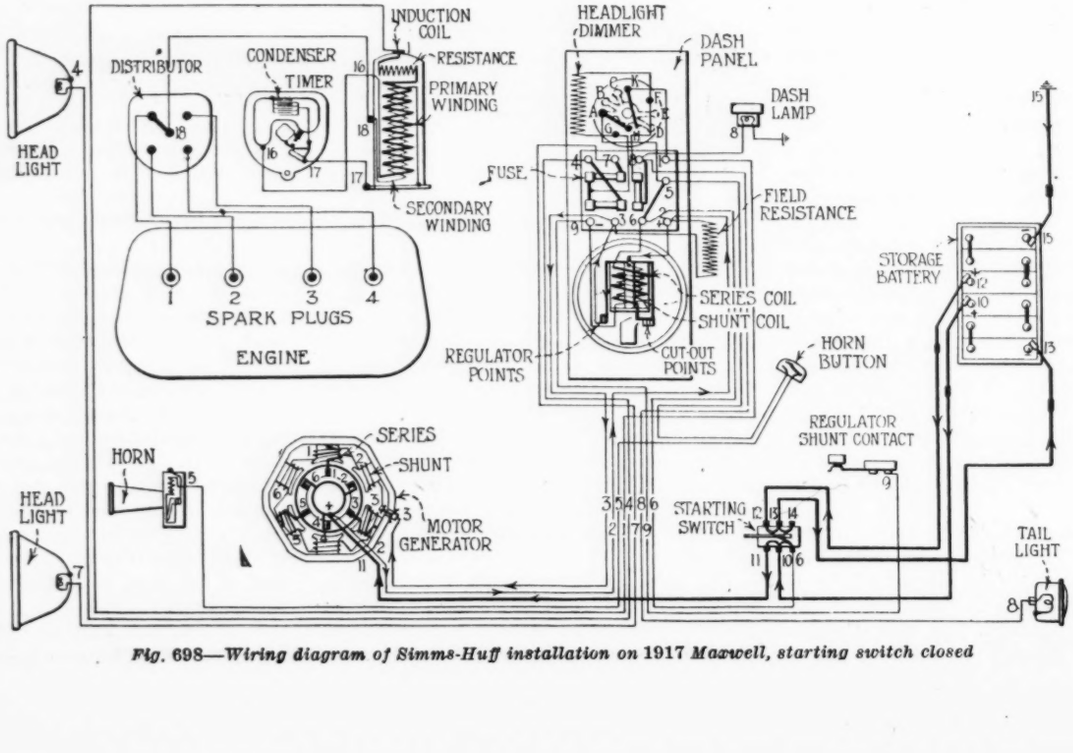


Fig. 698—Wiring diagram of Simms-Huff installation on 1917 Maxwell, starting switch closed

Have You a Little Rabbit in Your Place of Business?

NEW YORK TRACTOR PLANS

Albany, N. Y., April 5—New York is contemplating five tractor demonstrations the coming season, all of which will be staged directly for tractor manufacturers and not for dealers and distributers as entrants. The exact dates of these demonstrations have not been scheduled. The plan is to have two-day demonstrations, so there will be one or perhaps more devoted to plowing and the second day for fitting. The two days will give a better opportunity of obtaining accurate records of performance than the acre or hour tests of last year.

The demonstrations will be divided over the state with one for the western section, which probably will be in the vicinity of Batavia. One in the central section will be held at Syracuse and will have to be at the same time as the state fair. This would not be so important a demonstration from the standpoint of performance but would be more in the nature of an exhibit. One would be in the eastern portion of the state, possibly in the area of Hudson, the fourth would be held in southern New York in the vicinity of Elmira, and the fifth in the northern portion of the state in the zone of Malone or thereabouts.

New York at present owns seventy tractors and during last winter established three repair depots where these tractors were overhauled. These were in Syracuse, Ithaca and Albany.

CANADIAN RESTRICTION LIFTED

Ottawa, Ont., April 4—Restrictions on the importation of cars into Canada are lifted. It will be remembered the Canadian government during the war decreed no car should be imported into Canada that cost more than $1,250. Later it was permissible to bring in a car costing more than this but only under a special license granted by the government. An order was issued recently lifting this restriction.

DE PALMA AT DENVER SHOW

Denver, Col., April 4—As an extra drawing card for the Denver automotive show now in progress, Ralph de Palma gave three exhibition drives of 3 miles on a policed stretch of Logan street yesterday in his airplane-engined Packard. His fastest time was announced as 120 m. p. h. Following this demonstration, de Palma took his car out to the show for thousands of visitors to view.

MAGNETO MAKERS IN CAMPAIGN

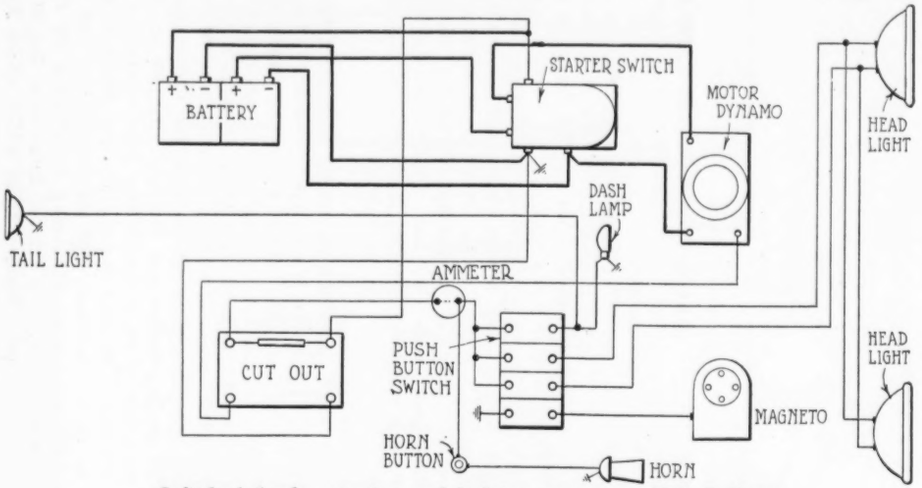
New York, April 4—Five of the principal manufacturers of magnetos have banded together to institute a propaganda campaign to popularize the more extensive use of magnetos on various forms of automotive equipment.

The magneto association has established headquarters and includes Splitdorf Electrical Co., Newark, N. J.; Bosch Magneto Co., Springfield, Mass.; Simms Magneto Co., East Orange, N. J.; Eisemann Magneto Co., Brooklyn, N. Y.; Ericsson Mfg. Co., Buffalo, N. Y.

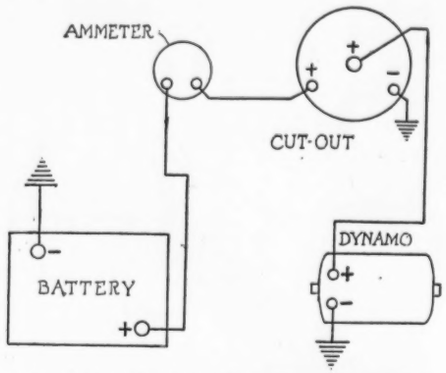
SCHUMANN JOINS GENERAL MOTORS

New York, April 4—John J. Schumann, Jr., has become assistant financial manager of the General Motors Acceptance Corp., the subsidiary of the General Motors group formed to finance its dealers. He was executive secretary of the distribution committee and assistant director of distribution of the Liberty Loan committee for the Second Federal Reserve District, and his services with the Government loan organization are being volunteered by the corporation for the duration of the fifth Liberty Victory Loan which opens April 21.

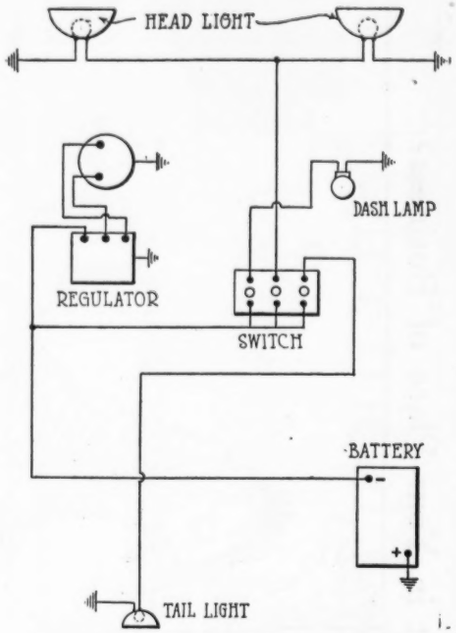
Motor Age Wiring Diagram Chart No. 23



Splitdorf-Apelco starting and lighting system on 1916 *Pullman*

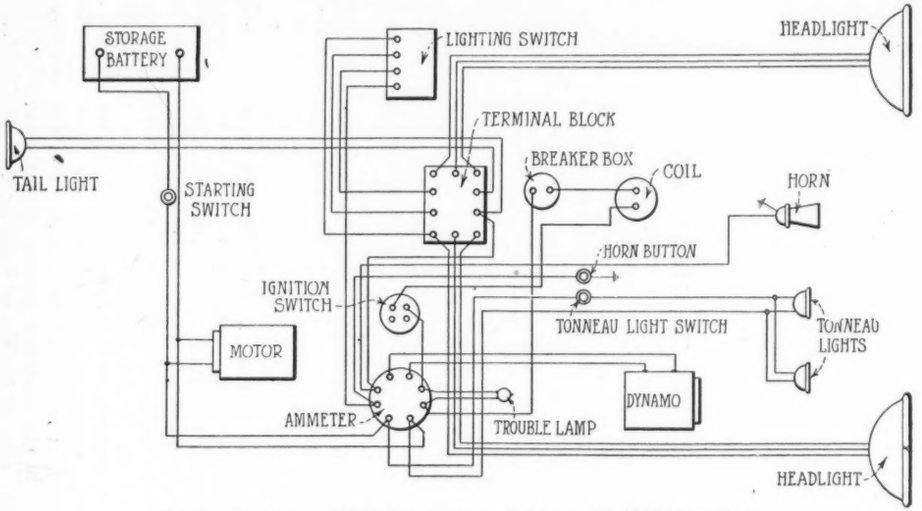


Auto-Lite lighting units a reader installed on Regal

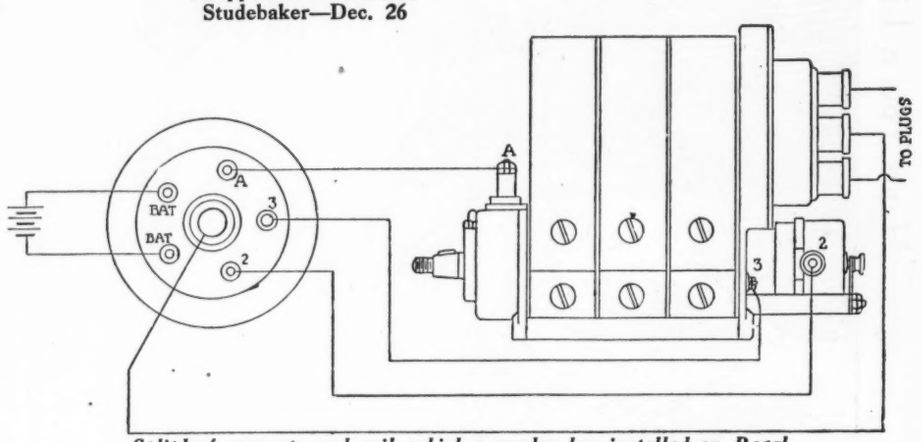


Arrangement of light wires on Regal

Abbott—March 20-27
Alter—Nov. 14
Apperson—March 6
Buick—Nov. 21-April 3
Cadillac—Dec. 19
Cole—Jan. 23-April 3
Case—Feb. 27
Chalmers—Feb. 20
Chandler—April 3
Chevrolet—Nov. 28-March 27
Detroiter—March 6
Dodge—Dec. 12
Dort—March 13
Elgin—Feb. 27
Empire—March 13
Ford—Jan. 30
Grant—Feb. 27-March 27
Henderson—April 3
Hudson—Dec. 5
Hupmobile—Feb. 13
Interstate—March 13
Krit—Feb. 6
Little—March 20
Locomobile—Jan. 23
Marion—March 6-20
Marmon—Jan. 9
Maxwell—Jan. 16
Mercer—Jan. 23
Michigan—March 20
Mitchell—Jan. 9
Oakland—Jan. 2
Oldsmobile—Jan. 23
Overland—Nov. 7-14
Regal—Feb. 6
Reo—Feb. 27
Scripps-Booth—Dec. 26
Studebaker—Dec. 26



Remy starting and lighting system used on the 1915 *Premier*



Splitdorf magneto and coil, which a reader has installed on Regal

Why We Should Support the Fifth Liberty Loan

THERE are three reasons why readers of MOTOR AGE should subscribe to the utmost to the Fifth Liberty Loan, which is to be offered the public this spring. The three reasons are:

1—Nobody wants to be a quitter. The war is ended but the bills have not all been paid.

2—Never before in the history of the Nation have business and professional men been so well able to make large subscriptions.

3—The Fifth Liberty Loan bonds of the United States will be the safest and best investment any citizen can make.

As regards the first reason, it is obvious that the end of fighting did not bring an immediate decrease in expense. We gained immediately by stopping the use of shells and powder. But wages and maintenance went on unabated. If men were no longer sent abroad, they were being brought home. Munitions contracts were cancelled, but these cancellations largely appertained to work not yet undertaken, leaving the plants still busy with work in hand. Moreover, the cancelling of every contract carried with it a penalty payment intended to protect the manufacturer. For these reasons the Government's outlay has been larger per diem since the armistice was signed than it was before.

Two-thirds of the Fourth Liberty Loan went to repay the Government's short-term borrowings at the banks. The additional cash raised was all expended before Dec. 1. Since then the Government has been borrowing $300,000,000 a week from the banks on short-term certificates. If these are not redeemed by money paid in by the public, the banks' surplus will be frozen up in Government bonds and the funds available for financing general business will be by that amount decreased, and business activity will be curtailed.

As regards the second reason, the tabulation of commercial failures for 1918 shows that American business was never more prosperous or sound. For the twelve months just closed there were only 9982 failures as compared with 13,855 in 1917, 16,933 in 1916 and 22,156 in 1915. This 1918 total is the smallest since 1899 and, considering the growth of the Nation's business, is relatively even more satisfactory.

As to the third reason, there seems little question that the Fifth Loan bonds will become the favorite security of the whole list as an investment for business funds that must be kept in very liquid form. It has been announced that the Fifth Loan bonds probably will be short-term obligations, so as not to compete with the outstanding Liberty issues. The Third Loan bonds, because of their maturity being shorter than that of the other issues, already are selling at a 1 per cent premium above the others. Business men are buying them for their cash reserve because they have only ten years to run and will class as a cash asset. The bonds of the forthcoming issue will have even a greater claim for favor for such use. This insures a very broad and active market.

Again, the various Government issues must eventually sell to a premium. The bonds of the four issues outstanding have been kept at their present level by reason of the flood of new Government securities that had to be poured out. As soon as the Fifth Loan is out of the way conditions must become more normal.

As regards the equity behind the bonds, there is no other security on earth to compare with them. The national wealth of the United States is tremendous as compared with that of other nations, and its national debt is, by comparison, very small. The Union has the greatest gold stock ever accumulated by any nation—half as large as the combined gold of the fourteen next most wealthy nations. The net balance of trade in our favor will be something like four times as large as it was before the war, counting in the $500,000,000 interest a year foreign governments must credit us with. The financial position of the United States will be impregnable.

The Readers' Clearing House

Questions and Answers

Conducted by B. M. Ikert

Car Pick-up Speeds

Q—Which car of the six-cylinder touring car type of below $2,000 has the quickest pick-up on the high gear?—Harold King, Hope, Ark.

This can be told only by a trial and much will depend upon carbureter adjustment, condition of the timing apparatus, capability of the driver, condition of the clutch and the general condition of the car as to lubrication, adjustment, etc. The condition of the valves, rings and other parts of the engine will have to be taken into consideration also. Two cars of the same make, with the same driver and with every adjustment as nearly perfect as is possible, will show a vast difference in both speed and acceleration.

Hudson Racing Car

Q—Publish photograph of the Hudson racing car. Show body alone, giving width of radiator, at dash, at seat and height at dash.
2—What is the wheelbase?
3—Was engine set back and lowered in frame?
4—To what road clearance?
5—How was the valve timing changed, and were larger valves used?
6—In what way was the oiling system and water circulation changed from standard?
7—I understand there were two sets of ignitions used. Were these Delco, or was a magneto used?
8—How much stock can be milled from cylinder head to increase compression, or should I use a metric spark plug?
9—Two carbureters were used. Were these standard, and how can they be installed?—R. W. Walters, Indianapolis, Ind.

1—The car is shown in Fig. 1. The dimensions are not available.

2—The wheelbase was 108 in.

3—A standard frame was used, a section about 17½ in. being cut out of the center. The engine was set in a standard position and on standard engine braces. The car itself, however, stood a little lower, due to the fact that flat springs were used both front and rear.

4—The road clearance was practically standard, approximately 10½ in.

5—The racing engine contained 2⅛-in. valves, with racing camshaft, which gave about ⅜-in. lift and, of course, quicker opening and closing, which was particularly effective at very high speeds.

6—The oiling system was force feed through a drilled crankshaft. A gear oil pump was mounted at the front end of the engine, coupled with the timing gears. The design of the water pump was slightly changed in that the force of the paddle was cut down to prevent syphoning under high speeds.

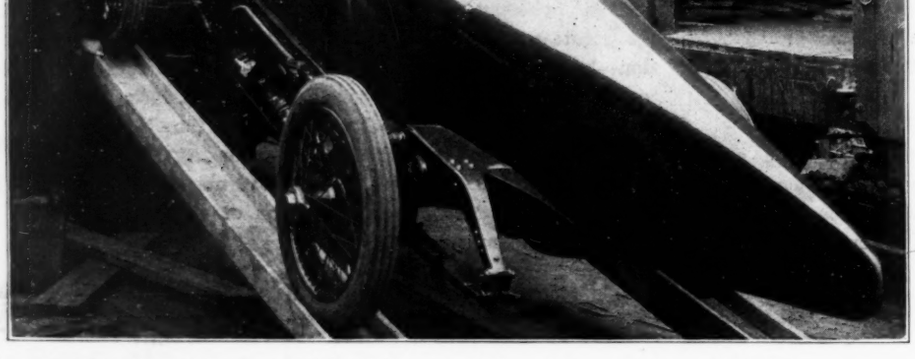


Fig. 1—This is the Hudson racing car, showing it being loaded for shipment

Miscellaneous

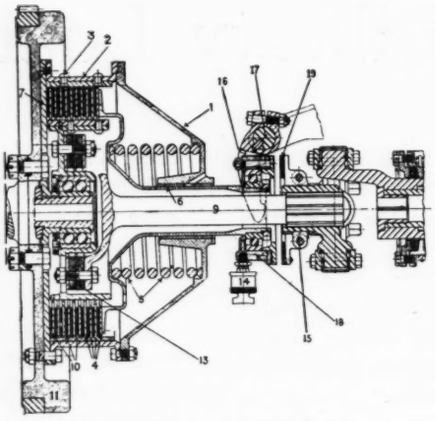


Fig. 2—Clutch on Locomobile, with points of adjustment

7—The only change in the Delco system—which, by the way, was used in its entirety—was in the use of a double set of contact breaker points.

8—The cylinder combustion chamber remained standard except that the head was polished. The waterjacket, however, around the cylinder heads was increased and the head was tapped for metric plugs instead of standard.

9—Two standard Super-Six carbureters were used, which called for a cylinder block containing a little different casting of the intake manifold to take the two carbureters.

Assembling Locomobile Clutch

Q—Explain and illustrate the manner in which the clutch on the 1916-17 Locomobile can be assembled.—Elsom Garage, Oak Park, Ill.

This is a dry-plate clutch and is illustrated in Fig. 2. If the clutch is completely dissembled, the first step is connect to the flywheel the malleable iron housing 2. The housing contains six hardened steel keys, 3, and these drive the steel disks. The universal joint at the end of the short countershaft permits this assembly without disturbing any other part of the driving members. Place the ball race on the center hub of this housing that is attached to the flywheel, and then slip over the ball race the driving cover which has disks attached to it.

Be sure the fiber disks are in place and that they are free to move. This is one of the most important points to remember in connection with this clutch. The two housings, 1 and 6, with the spring in between next are slipped over the rear end of the countershaft, and then the countershaft is bolted to the connection cover over the ball bearings, 13. The housing 6 is slid over and up against the steel disks, 4. The compressing of the main spring is the next job. Large and very strong C clamps may be used to pull the housing 1 up to the housing 2, and it then can be bolted in place. Care must be exercised to see the clamps are tightened up evenly or else the spring is likely to force the housing back as it slips off the clamps, resulting in possible personal injury.

Garage for Owner

Q—Print in MOTOR AGE a plan for a garage for my home. This garage is to be two stories high, with concrete floor and tiled roof, with sandstone walls about 4 or 5 feet high, to be finished with brick. My car is an Oldsmobile, and I will need quite a large garage. I should like also to have some idea of the cost.—G. H. Smith, Clarksville, Ark.

Since you ask for a two-story garage, we assume you intend using the second story for a chauffeur's apartment and have planned the building accordingly. The garage proper is of ample proportions for any car, and with the heater in a room by itself, all dust from coal and ashes is kept

out of it. It is well lighted on three sides, has a generous bench and plenty of space to work in when making repairs and overhauling.

The entrance to the stairway to the living rooms is through the heater room. This will keep the gasoline and oil smells from ascending and also make a better separation of garage and domesticity.

We believe brick would make a beautiful combination with your sandstone base, something that would make a bond of color harmony between the sandstone and the tile roof. Stucco also would be very effective and could be colored to suit the conditions.

As to giving you an idea of the cost, that would be impossible. We might give you some idea of Chicago prices, but no doubt prices are much lower in your section, and our Chicago prices would only be a crude guess under the present condition of the material market.

Why Babbitt Sticks

Q—We have noticed how firmly the babbitt is attached to the iron on the Ford connecting rods. Is there some preparation used to make the babbitt stock?—W. W. Orr, Aneroid, Sask.

Nothing special is used to make the babbitt stick, other than the general porosity of the steel. If the rods are not first properly heated the babbitt does not stick so well.

Stutz Records

The answer on page 35 of the issue for March 19, given in reply to an inquiry by E. S. Phillips, Spokane, Wash., in regard to records held by the Stutz car, is incorrect. Among others, the 350-mile record, made by Gil Anderson in a Stutz at Sheepshead Bay, Oct. 9, 1915, when he won at an average speed of 102.56 m.p.h., has never been beaten.

Why Car Breaks

Q—What is the best way to take up end play in crankshaft and camshaft on Hupmobile 32?
2—What causes so-called crystallization of metal, such as driveshafts and rear axleshafts, that often break almost as clean and even as if they were cut with a knife?
3—What is it that this often will break while driving on the level at moderate speed when perhaps an hour or so before and in some cases a few minutes before you had climbed a heavy grade pulling the engine hard?
4—What action, if any, upon the paint or tires of a car has coal ashes and cinders when used as floor of a garage?
5—How much more speed would I get out of this car by installing bevel drive pinion with fifteen teeth instead of the present one with fourteen teeth? This car will make about 50 m.p.h. or better.—E. A. McCune, Carnegie, Pa.

1—The back end of the front bearing on the crankshaft, the front end of the back bearing and both ends of the center bearing are called upon to care for end play in most crankshafts, as they are in the Hupmobile 32. If the bearings are in fairly good condition, perhaps the replacement of only the center bearing will suffice, making it a snug enough fit to perfectly center the crankshaft. But while you are doing this is would prove wise policy to replace all bearings and thus absolutely do away with trouble for several years to come. New bearings ought to be good for five or six years at the least and with very little attention other than keeping them tight.

2—Crystallization is caused by separation of the molecules, brought on by fatigue of the metals, and fatigue is caused by long continued and hard use or overwork, just as these things will break down the strongest human being. There may happen to be one spot a mite weaker than another, or a spot that has not been hardened as much as another, and anything breaks at the weakest point. Naturally, when it starts to go at a certain spot it continues at that point.

3—The fact that your car has been through a hard pull and a shaft, for instance, breaks when running on perfectly good surface indicates that the break has been coming and just happens to develop at the time mentioned. It has been just ready to go and has been holding out by a so-called thread through a hard pull.

4—Nothing in particular, unless the dust is allowed to rise and settle on the varnish and then is rubbed off in such manner as to scratch the surface. Naturally, a concrete floor is better, for this will not permit dust to accumulate and may be washed.

5—If your Hupmobile 32 will make 50 m.p.h. or more it is pretty fast. You would get about 3 or 3½ m.p.h. more, provided you could get it under way and keep it going to pick up to that speed. But if you change the pinion, you also must change the ring gear; it will not do to put in a new pinion against an old and worn ring gear, for they would not work well together. Better leave it as it is.

TO assist readers in obtaining as a unit all information contained in this department on a certain subject MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

MISCELLANEOUS

Harold King.....Hope, Ark.
R. W. Walters.....Indianapolis, Ind.
Elsom Garage.....Oak Park, Ill.
G. H. Smith.....Clarksville, Ark.
W. W. Orr.....Anerold, Sask.
E. S. Phillips.....Spokane, Wash.
E. A. McCune.....Carnegie, Pa.

THE ELECTRIC SYSTEM

Charles Hetherington.....Bentleyville, Pa.
John G. Thompson.....Pittsburgh, Pa.
D. J. McLaughlin.....Ontario, Canada
William Haas.....Raub, Ind.
Subscriber.....Lynndyl, Utah
H. Davis.....Clarion, Iowa
Jay Arthur.....Rock Island, Ill.
E. J. Becker.....Millville, Minn.
L. W. Joerndt.....Cleveland, Ohio
A. L. Burk.....Highland Park, Mich.
B. L. Guerin.....Chicago
George Schultz.....Shattuck, Okla.
Walter Wilson.....New Rose, Ind.

CARBURETION

William Kauffman.....Perry, Iowa
R. S. St. Pierre.....Williamsport, Pa.
Theodore Sampson.....Alamo, N. D.

ENGINES

B. Morse.....Drummond, Mont.
H. E. Riester.....Detroit
Thomas A. Fliess.....Kenosha, Wis.
R. E. Addy.....Geyser, Mont.
D. B. Diseroad.....Valejo, Cal.
F. Englert.....Gurley, Neb.
Roy M. Martin.....Keokuk, Iowa
James L. Bostie.....Malden, Mo.
H. J. Williams.....Osceola, Ind.
Charles Godlon.....Memphis, Tenn.
E. A. McCune.....Carnegie, Pa.
Morris Ferguson.....Salt Lake City, Utah

REBUILDING

F. Lloyd Mark.....Chicago
Charles L. Foster.....Alliance, Ohio
R. F. Gilman.....Philadelphia, Pa.

No communication without the writer's name and address will be answered in these columns.

The Electric System

Electrical Questions and Diagrams

Q—Publish wiring diagram of Delco system used on 1911 Cadillac.
2—What are the working principles of controlling relay?
3—Publish diagram of ignition switch, how points should stand with switch on magneto and battery.
4—Publish wiring diagram of 1917 Haynes Model 36.—Charles Hetherington, Bentleyville, Pa.

1—See MOTOR AGE wiring chart for Dec. 19.

2—By controlling relay you probably mean the regulator. This inserts into the field circuit a resistance when the voltage

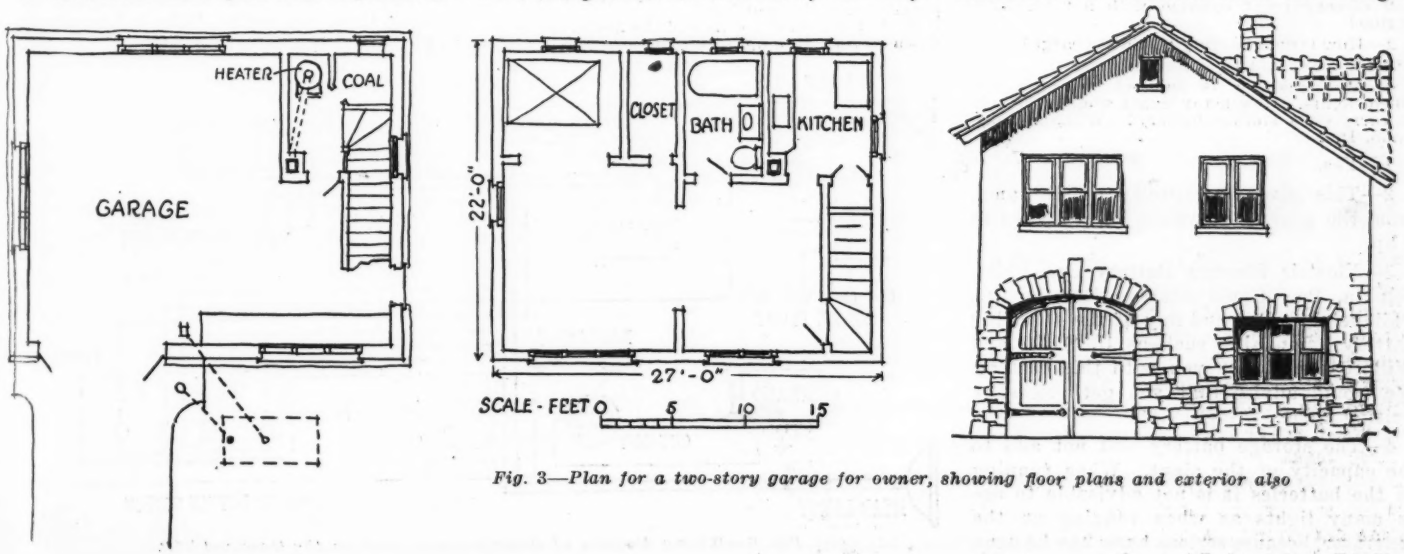


Fig. 3—Plan for a two-story garage for owner, showing floor plans and exterior also

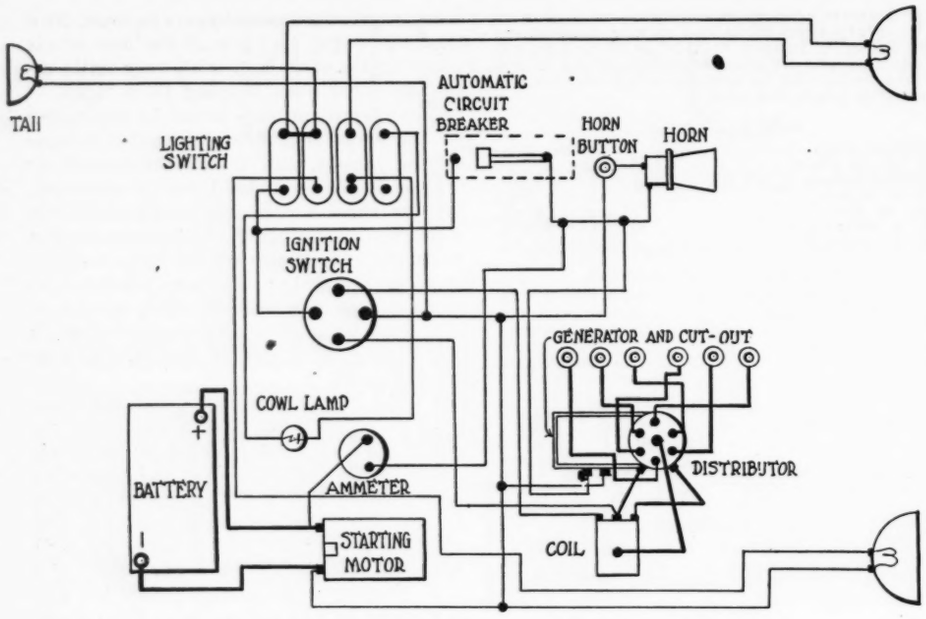


Fig. 4—Wiring diagram of electric system on 1917 Haynes model 36

increases above the required amount. As soon as the voltage decreases, due to this resistance being inserted, the resistance is cut out. This is done very rapidly, many times a second, and the result is constant voltage from the generator.

3—Referring to Fig. 5, the back view of the switch is shown. The handle on the right side is the distributer position, and when on the left side is in the magneto position.

4—This is shown in Fig. 4.

Buick Wiring Diagrams

Q—Publish wiring diagram for Buick D35 1917 four-cylinder. How may ammeter be attached?—John G. Thompson, West Vies, Pittsburgh, Pa.

See MOTOR AGE for Feb. 13.

Wiring of Overland 75B

Q—Show wiring diagram of model 75B Overland? I took out the Dixie 40 magneto and installed a distributer Auto-Lite system, but I lack the necessary knowledge of how to wire it up properly.—D. J. McLaughlin, Ontario, Can.

This is shown in Fig. 6.

Batteries with Ellis Engine

Q—Could I attach a storage battery to a 60-volt direct-current dynamo with a 9-hp. Ellis engine?

2—How large a battery would it charge?

3—Where could I get such a battery?

4—My generator is suposed to carry 200 20-cp. lights. How many lights would I be able to carry on a storage battery?—William Haas, Raub, Ind.

1—Yes.

2—This gives a capacity of 113 amp. from the generator, which is equivalent to 9 hp.

3—Electric Storage Battery Co., Philadelphia, Pa.; Gould Storage Battery Co., Philadelphia, Pa., and any of the other big battery companies, such as U. S. L., and Willard can supply you with this battery. We would advise that you get prices by writing them.

4—The storage battery will not add to the capacity of the plant. When running on the batteries it is not advisable to use as many lights as when running on the generator, because serious harm can be done

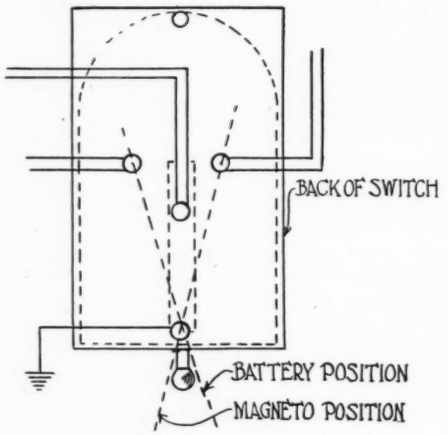


Fig. 5—Delco switch on 1911 Cadillac, showing the back view

the batteries, whereas an overload on the generator merely will kill the engine and no harm will be done.

Batteries on R. R. Car

Q—I am using dry cells for ignition on two-cycle R. R. cars of 4 and 6 hp. Fairmont engines, vibrating coils and Bemis timers. What is the proper way to connect up the dry cells in series, parallel or series-multiple?

2—If I use six dry cells and the amperage gets down to 8 or 10 amp. a cell connected in series, would it be advisable to connect them up in parallel, which would give the total amperage of all six?

3—What is the best way to connect them for ignition and for a headlight?

4—How much amperage is safe to use in a common vibrating coil?

5—How much voltage is safe to use in a common vibrating coil?—Subscriber, Lynndyl, Utah.

1—Series connection of the cells gives greater voltage with the amperage of one cell. Parallel connection of the cells gives the voltage of one cell but the combined current of all. If you need about 6 volts and have about twelve cells, then connect up two sets in series, six in each set, and then connect the sets in multiple.

2—If the coil needs 6 volts, then connecting the batteries in parallel will do no good, for the voltage will be lowered to about 2.

3—Combination of series and parallel as in 1.

4—Two or 3 is commonly found in most systems.

5—About 6 volts.

Starting a Magneto

Q—How can I wire my 1915 Maxwell so it can be started from dry cells and switch to magneto?

2—Can I use the same switch as is on now? The storage battery and all other wiring have been removed.

3—Publish wiring diagram of the 1915 Maxwell Simms-Huff motor-generator.

4—Publish instructions to install a dashlight.

5—In pushing in on starter pedal with battery charged the starter fails to turn the engine over. This car is at times hard to start by crank. Valves are newly ground and properly seated. Gas properly supplied and new dry cells.—H. Davis, Clarion, Iowa.

1—The magneto on a 1915 car is a high-tension type. On pressing the starter switch you simply intensify the magneto with the dry cells. The dry cells are used only for starting. The magneto is strictly high-tension in running. By connecting a switch across the two small lines on the side of the starter switch you can turn the switch on and it will keep your magneto intensified.

The Simms high-tension magneto used on the 1915 Maxwell consists of a dual system in which is provided a small non-vibrating coil which can be attached either to the frame or dash, as it is not affected by either heat or moisture. It is shown at the side of the magneto in cut. The coil being non-vibrating, there is nothing to get out of order or require adjusting. Four or five dry cells are used in connection with this system, and care must be taken to connect them correctly. This is important, and the wiring diagram should be con-

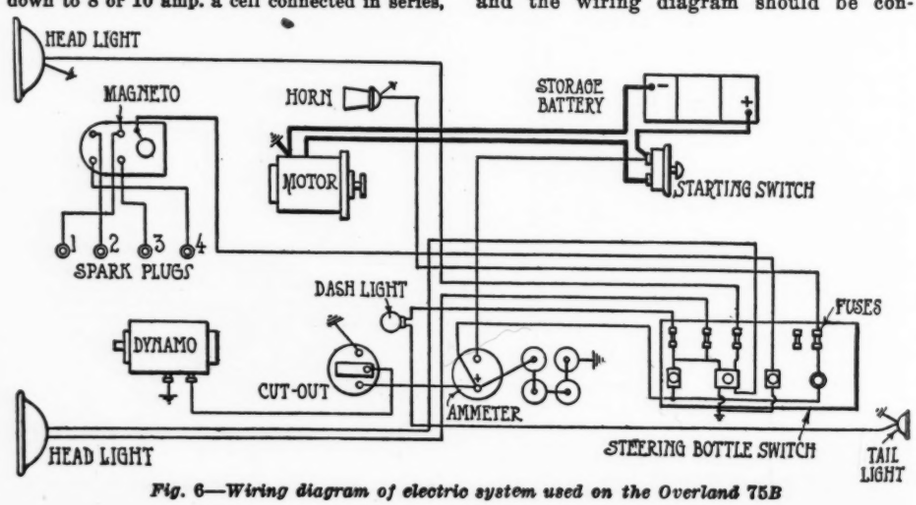


Fig. 6—Wiring diagram of electric system used on the Overland 75B

sulted before disconnecting or connecting any of the ignition wires. The switch operating the battery circuit is in connection with the starting switch, and when the starting pedal is depressed, thereby throwing the starting motor into operation, the current flows through the switch, coil and magneto. It is readily apparent that the operation is simple, with the additional advantage that it is impossible to leave the switch on unconsciously and run down the batteries.

2—No; it will require a new switch.

3—This was shown Jan. 16.

4—To install a dashlight ground one wire and connect the other wire to the fuse cover plate, located under the seat, as shown.

5—There is a possibility that there is a short in the starting switch, or it may be the plunger is worn so that when the pedal is pushed down it does not form contract within the switch.

Monroe Wiring and Parts

Q—Publish wiring diagram of Monroe roadster.

2—Where can I get repairs for Monroe roadster?

3—How many models did they put out?—Jay Arthur, Rock Island, Ill.

1—The Auto-Lite system used on the Monroe was shown March 13.

2—Monroe Motor Co., Pontiac, Mich.

3—Six.

Delco on Dodge

Q—Publish diagram of the Delco wiring used on the Dodge Brothers car?—E. J. Becker, Millville, Minn.

This is the Delco ignition only and not the complete electrical equipment of the car. It is shown in Fig. 7.

Wiring of Briscoe 4-38

Q—Publish wiring diagram of 1916 Briscoe, 4-38.—L. W. Joerndt, Cleveland, Ohio.

This is shown in Fig. 8.

Lights on Magneto

Q—I do not drive my Moon six, 1917, car enough at times to keep the battery charged. I find my battery to be the principal trouble and expense. Can I install a magneto that I can connect up and have reasonably good lights?

2—Publish the names of several good magnetos that could be used on this car?—C. D. Furinton, McCook, Neb.

1—An ordinary magneto will not light your lights. If you want to do some original designing, you might install a system similar to the Ford, which is an alternator and generates alternating current. Installing a magneto will do away with your starter, so why not leave the present system on and crank the car by hand most of the time. The battery runs down chiefly because the starter runs it down. It must be remembered that about 400 amp. are taken from the battery momentarily during the start, and if the generator is not run enough to supply this, then the battery will run down. If you are going to install a magneto, you lose the lights and the starter, but if the system is left as it is and hand cranking instituted, you retain the lights.

2—Bosch, Berling, Dixie and Eiseman.

Ford Has No Condenser

Q—Does the Ford ignition coil contain a condenser?

2—If not, would there be an advantage in connecting condensers to the coils? How should this be done?

3—How could I obtain suitable condensers?—A. F. Nerlinger, Madison, Wis.

1—No.

2—The advantage would be small but would help nevertheless. Connect the condenser across the terminals of the vibrator.

3—You probably can get condensers from any telephone supply house.

Installing Bosch Magneto

Q—I have equipped my 1916 Chevrolet 490 with a Bosch magneto, doing away with the coil and distributer. Publish diagram showing how wiring should be arranged.

2—How can the charging rate be raised in an Auto-Lite generator on this model? It will not charge more than 8 amp. at 20 m.p.h.—H. J. Hoefli, St. Louis, Mo.

1—It is hardly necessary to illustrate this because of the simplicity of the wiring. Remove the low-tension wire leading to the coil, or leave it on if you want to. It will not be used. If the magneto is going to be installed where it will be driven from the distributer drive, then it will not be necessary to remove the high-tension wires from the spark plugs. Just connect these wires to the magneto timer in the order of 1-3-4-2, and the job is done.

2—Before changing the charging rate, sand off the commutator of the generator and inspect the mica to see if it projects above the surface of the commutator. If the charging rate still needs to be increased, move the third brush, which is the smallest of the three. Watch the ammeter while this change is being made, and if the rate decreases, then the brush is being moved in the wrong direction. This movement is very slight, and care should be exercised in adjusting the rate, as damage to the battery will be done if the rate is increased too much.

Adjusting Charging Rate

Q—How can I increase the charging rate of the generator on my Maxwell?—Thomas Brown, New York.

A resistance coil is in series with the shunt field of the generator. This coil is on the dashboard with the panel of switches. It automatically is put in series with the field of the generator when the voltage is high and taken out when the voltage is low, occuring with great rapidity, as in a buzzer. The regulation can be varied by adding to the resistance of this coil or taking off a few turns until the required charging rate is reached.

Magneto on Studebaker

Q—I intend installing a Bosch DU6 magneto on my series 17 Studebaker six, but I am unable to find a suitable place for it. Would it be possible to bolt it on the bracket on top of the water pump, where the coil from the present ignition system is or put it on a special bracket and connect it with the water pump? Publish diagram showing the connection and method of installation.—B. L. Guerin, Chicago.

The Studebaker distributer in Chicago advises there has been only one installation of this kind, and it seems that the position chosen for the magneto in that case was the best. Here is how that installation was made. The pump shaft was removed, and the back end of the pump case was drilled, tapped and a bonnet and gland fitted as shown at A in Fig. 9. Then the old shaft of the pump was removed and a new one fitted, as at B. This was longer and projected through this new pump gland

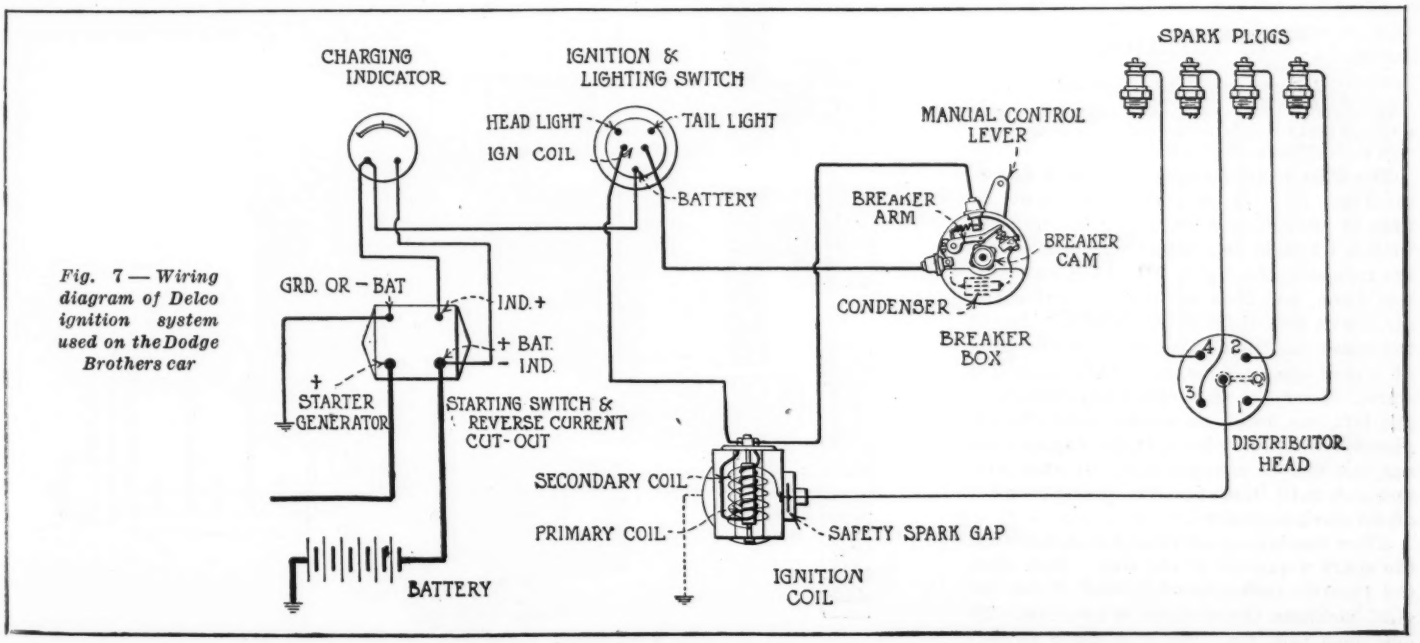


Fig. 7 — Wiring diagram of Delco ignition system used on the Dodge Brothers car

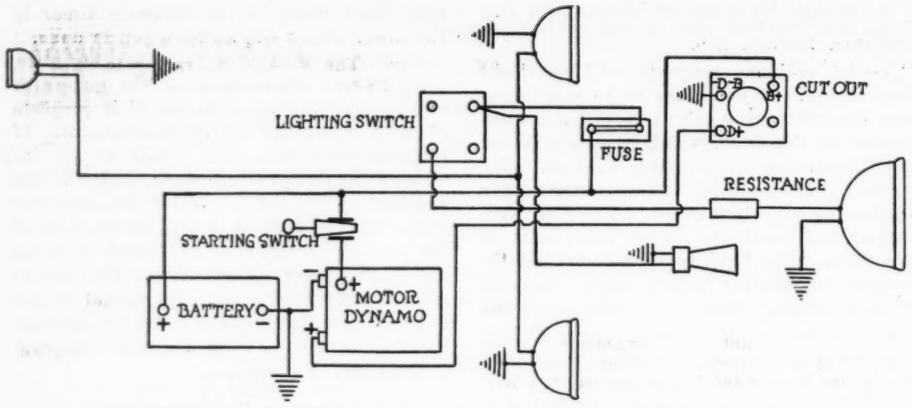


Fig. 8—Wiring diagram of Splitdorf-Apelco system on the Briscoe

so the magneto could be connected to it. This necessitated the removal of the oil filler and breather and relocating it at the rear of the engine. This installation is very satisfactory and gives a positive drive for the magneto. An improvement over this construction could be made by making the new shaft in two sections and connecting them with a flexible leather-faced coupling. These will absorb the pulsation from the drive of the magneto and impose a smaller strain on the shaft.

Specific Gravity of Acid

Q—What gravity of acid should be put in a storage battery when the acid was all spilled during shipment?—George Schultz, Shattuck, Okla.

Use acid whose specific gravity is about 1220, and then charge the battery very slowly until its specific gravity reaches 1285 or, better still, 1300.

Magneto on Ford

Q—Will the installation of a high-tension magneto outfit on a Ford engine improve the running qualities of the car?
2—What are the advantages of a high-tension outfit over the vibrating coils of the Ford?—Walter Wilson, New Ross, Ind.

1—Yes, other things being equal.

2—Four coils cannot be adjusted exactly the same. This accounts for irregularity in the sound of Fords. A magneto gives a spark of the same intensity to each cylinder.

Carburetion

Adjusting EE4A Rayfield

Q—Publish picture and instructions to adjust a model EE4A Rayfield carbureter on a Mitchell.—Wm. Kauffman, Perry, Iowa.

The EE4A Rayfield carbureter is shown in Fig. 10. It is first important to bear in mind that in enriching the mixture with a Rayfield carbureter all adjustments are turned to the right. Have the dash control down, and then see that the automatic air valve sets lightly but firmly. Retard the spark and then close the throttle. This of course can be done only while engine is warm. Turn the slow-speed adjustment to the left one notch at a time until the engine operates smoothly. If the engine does not run slowly enough, turn the stop arm screw A until it runs at the lowest number of revolutions desired.

After the low-speed is adjusted, advance the spark a quarter of the way. Now open the throttle rather quickly, and if the engine backfires the mixture is too lean. To overcome this, turn the high-speed adjustment until the engine can be accelerated quickly without backfiring.

If the engine misses or backfires at intermediate speed, turn the air valve adjustment to the right until the proper operation is secured.

Engine Overheats

Q—My Pathfinder 3B overheats at speeds over 40 m.p.h. and hillclimbing for any great distance. There is no apparent leak in the cooling system, but the water boils in the radiator and requires constant refilling. Could the position of the fan be raised or lowered to help this?
2—Would a fan with more blades help?
3—What else could cause this? The water pump is O. K.—Roland S. St. Pierre, Williamsport, Pa.

1—Either your carbureter is out of adjustment or the timing is wrong. Too rich a mixture will overheat an engine when idling or on an easy pull and a light mixture will overheat it on a heavy pull. This would seem to be your trouble—too light a mixture, inasmuch as the engine heats on a hill and above 40 m.p.h. This would apply to the high-speed adjustment only. Do not adjust the low speed to give a richer mixture. If you have had the engine overhauled, perhaps the mechanic has not set the timing gears as they should be set.

2—Probably not, otherwise this error would have been discovered by the factory in testing out the chassis.

3—It may be the ignition timing is late and if it is, this would cause the trouble. Do you carry the spark as high as possible when driving fast and do you retard it too much when climbing hills? It is not necessary to retard the spark in climbing hills until the engine begins to knock and then it naturally must be laboring. In such case it is time to change gears, no matter what engine and how many cylinders you have. When the spark lever is fully retarded and the piston of No. 1 cylinder is at top dead center on the firing stroke, the breaker should just begin to open. This will be your correct ignition timing. If one cylinder is correct, all the others are.

Oakland Changes

Q—Do you recommend an extra gasket under cylinder head of Oakland 32 on account of poor grade fuel?
2—Will this have any effect on cooling qualities of the car?—Theodore Sampson, Alamo, N. D.

1—In the first place, putting on an extra gasket will increase the clearance volume and decrease the compression. This is a big change and quite a departure from the designer's intent. His knowledge of the conditions of fuel and possibilities of the engine with the fuel is probably more than the layman's. He designed the engine with those considerations in view. You will do better to make a more efficient fuel-heating device.

2—Yes, the engine will be cooler and will not operate so efficiently.

Engines

Not Improper Combustion

Q—My Overland 71 has run 3700 miles. Last fall I had the valves ground as the compression in cylinders two and three was weak. After this was done the compression was still weak, so I had the cylinders rebored and Lynite pistons with non-leaking rings installed. The compression trouble was remedied, but since then I have not been able to reach a speed of over 15 m.p.h. under load, when the engine will stop if the throttle is not closed and clutch slipped. I am sure the valve and magneto timing are right. I had the magnets recharged, thinking that the spark might not be hot enough to ignite the gas, but with no results. The car was factory equipped with a model L Schebler carbureter. During the last two months I have tried four

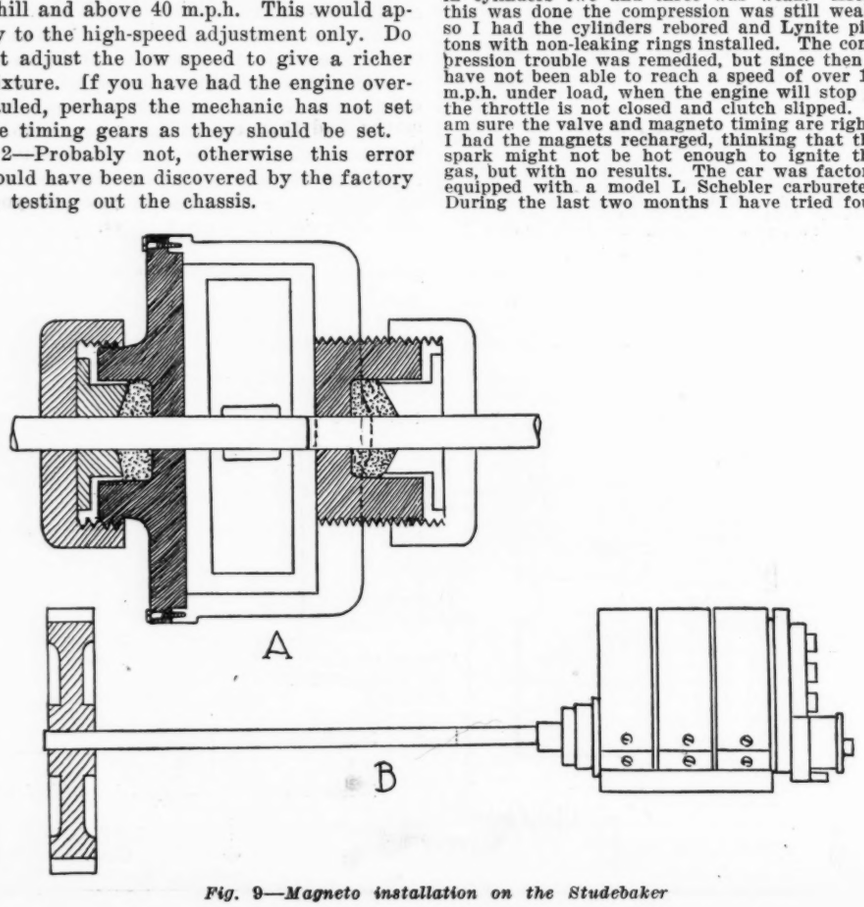


Fig. 9—Magneto installation on the Studebaker

other makes of carbureters, but with no marked change, so again have installed the Schebler. Several mechanics who worked on the car believe that the carbureter is too far from the combustion chamber and that condensation of the low grade of gasoline takes place in the manifold. This theory is in part carried out, as each time the engine is stalled or stopped, nearly a quart of gasoline runs from the carbureter. These conditions were the same with each make tried. At considerable cost I have experimented with high-test gasoline, but there was little change for the better.

2—If insufficient combustion or lack of heat is the trouble, why did not this trouble manifest itself before the reboring of cylinders?

3—If in your opinion a hot manifold would be a remedy, publish diagram of a heating device as applied to model 71 Overland.—B. Morse, Drummond, Mont.

1—If you are sure your ignition and valve timing are absolutely correct, we are inclined to think you have fitted the pistons with too little clearance, as in this condition the engine naturally would show little power and would tend to die down. You can tell this by a simple test. If the engine seems to work freely when first started and the trouble develops soon after, you may be sure this is your trouble. This type of piston needs more clearance because of its greater expansive qualities. There should be from 0.010 to 0.012 in. clearance to allow for expansion; larger cylinders require as much as 0.015 in. clearance.

If the pistons are found to be not too tight, then you may be sure the valve or ignition timing is not correct and these should be checked up. If the engine heats, it will be a good indication the ignition is late and loss of power, other than the piston trouble, would develop if the valves were not opening and closing at the right time.

2—The fact that this trouble did not manifest itself before new pistons were fitted is sufficient guaranty that it is not a question of improper combustion and that heat had has nothing to do with the case. You may have too rich a mixture, and in a cold climate there would naturally be some condensation. This is not at all unusual with the present grade of gasoline on the market.

3—Several devices to serve this purpose have been published in MOTOR AGE, but again we believe it is not necessary. You should have a hot-air pipe connected from a stove on the exhaust pipe leading to the air intake of the carbureter, and this can be furnished by any supply house or by any garage or repairshop.

Sundry Engine Data

1—The clutch on my 1915 Hupmobile touring car is hard to throw out. Is there any way to remedy this without making the clutch slip? By this I mean not to take off too much tension so the clutch will slip.

2—When I accelerate quickly and set the spark up the engine knocks, but if I retard the spark the engine does not knock. I cannot get away very fast. What is the trouble or how can I overcome this?

3—Is it on account of the long-stroke engine?

4—What is the maximum revolutions per minute of this engine and horsepower rating given by the company?

5—What is the bore and stroke of the Packard twin-six racing car driven by William Rader at Sheepshead Bay?

6—What is the maximum number of revolutions per minute, horsepower rating and rear axle gear ratio?

7—Is this an aviation engine?—H. E. Riester, Detroit.

1—There is no remedy for this. In the later models greater leverage was given to make the clutch lever operation easier. In the 1913 and 1914 Hupmobiles the clutch spring tension could be regulated by nuts on the clutch studs, but this practice was abandoned in the K and later models. Most drivers would be pleased to have a clutch that would hold as well as this. Perhaps the factory can furnish levers that will give greater leverage.

2—Your spark should be slightly retarded in getting away and until you have gained a little headway to permit the engine to gather momentum. This applies particularly to cases where the throttle is opened suddenly. There is a heavy load to start, and in doing this the engine cannot get up to reasonably high speed, which is necessary for the spark to be carried at full advance. Again, it may be possible your cylinders are full of carbon, which also will cause a knock. See that the carbon is removed and then retard the spark a little in starting, and you will be able to give greater and quicker throttle opening than if there is carbon to bother you and you carry the spark fully advanced.

3—The stroke would have nothing to do with it.

4—This engine should turn around 1600 to possibly 1800 to give its maximum horsepower. The N. A. C. C. rating is 19.6.

5—Rader's Packard was a twelve-cylinder car, having a bore of 4 in. and a stroke of 6 in., giving a piston displacement of 904.8 cu. in. It is the same car de Palma used in his record breaking work on the Daytona beach in Florida.

6—This was a special engine, and manufacturers do not give out details such as axle ratio, etc. The horsepower rating, N. A. C. C., is 76.8, but the actual power is about 260 hp.

7—It was an aviation-type engine, twelve cylinders, V-setting.

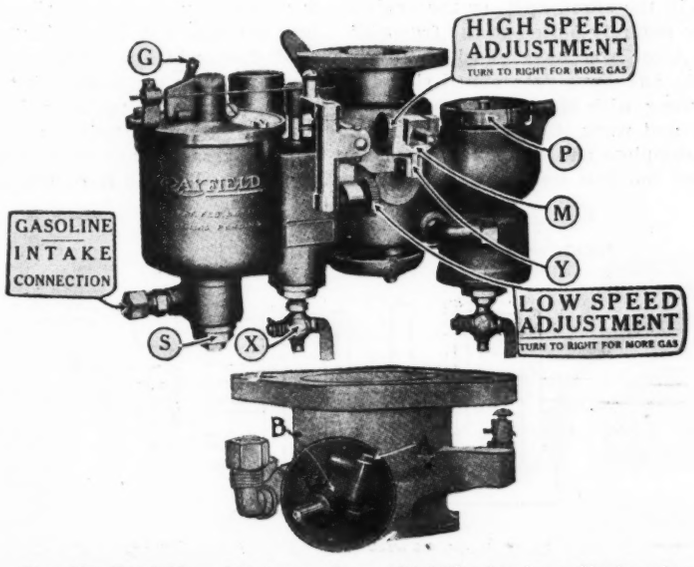


Fig. 10—Rayfield carbureter used on Mitchell, showing adjustments

Installing Piston Rings

Q—I desire to put on patented piston rings and tighten the bearing in my 1916 four-cylinder Oldsmobile. Can I drop the crankcase without removing the transmission or timing gear cover, or can it be done by loosening these parts?

2—Can I withdraw the pistons at the bottom or must they be withdrawn at the top?

3—Shall I put one ring in the top groove of each piston? The compression is weaker on two cylinders. Also the two front cylinders foul the plugs quite often.

4—How can I ascertain whether the crankshaft and connecting rod bearings have been adjusted properly?—Thomas A. Fliess, Kenosha, Wis.

1—Yes, the crankcase cover can be dropped without disturbing the other parts. After cleaning it thoroughly you will be able to see just the bolts that should be removed.

2—The pistons will come out from the under side; it is not necessary to remove the cylinder block.

3—You will have better results if you put in new rings all the way through, unless the two weak cylinders are so badly out of true that they need grinding to make them round. You should at least put two new rings on each piston in the two top grooves. It is more than likely this will prevent the oil passing the rings and fouling the plugs.

4—When you have the pistons out to fit the new rings, you will have disconnected the connecting rods at the crankshaft. Then it will be an easy matter to tighten up the main bearings by removing a thin shim or as many as seem to be necessary to bring the cap snugly against the crankshaft. This should be tight but not to the extent that the crankshaft cannot be turned. Unless you have had some experience in tightening bearings on both crankshaft and connecting rods, as well as fitting new rings, it would be well to have this work done by an experienced man. You can assist, and by watching the work you will be prepared to take care of the job the next time. It is an easy matter to get one bearing too tight and thus do more harm than good.

Timing Valves on Mogul

Q—How can I time the valves on a Mogul 8-16 tractor? There is only a dead center mark on the flywheel and no mark on the cam gear.—R. E. Addy, Geyser, Mont.

The exhaust valve should close a little after dead center and the intake should open just a little after the exhaust valve closes. The engine is on dead center when the D. C. mark on the flywheel is in line with the top of the frame channel.

Knock in Engine

Q—My Overland 83A, 1915, model has a knock. This is noticeable only when the car is going up a hill and when it has slowed down to 15 or 18 m.p.h. or on a pull when the throttle is

opened suddenly. The knock only lasts about 10 or 20 sec., or until the car has gained momentum. It appears to be in the first cylinder. What causes this?

2—Will putting moth balls in the gasoline do any harm to the engine or carbureter? If so, why?

3—How can I stop the oil from leaking around the valve lifts or pushrods? When the engine is speeded up a great deal of oil works out under the valve lift caps. Would using heavier oil help any?—D. B. Diseroad, Vallejo, Cal.

1—This is likely to be a loose wristpin bearing or bushing, although it may be loose crankshaft or connecting rod bearings or even a bad piston slap. The only thing to do is to take up all the bearings and examine the fit of the pistons in the cylinders. If there is considerable clearance between pistons and cylinder walls, the only thing will be to fit oversize piston. Perhaps the cylinders have worn slightly oval and in this case the cylinders will have to be reground and then the oversize pistons fitted.

2—It is advisable to leave such things alone. If they do no other harm, they will cause a sediment that will find its way into the carbureter and sooner or later will stop the fuel supply. We have never heard that moth balls are of any benefit to a gasoline engine.

3—A simple way would be to fit some sort of cap over the valve guide to hold in place a thick felt washer. This is shown in Fig. 11. The top of the guide can be threaded and a cap made to screw over this, placing the felt washer between, with a hole for the valve stem. If this affords too much work, fit a felt washer over the valve stem above the guide and wire it down to the guide. The latter will be at best a makeshift remedy. New valves and new guides, however, would cost less than to make the stuffing box first mentioned. Heavier oil might be of benefit in this case, provided the engine will stand it. There is such a thing as using too heavy oil, however.

Jackson Engine Horsepower

Q—Were any Willys-Knight sleeve valve engines used in airplanes or in any tanks?

2—What is the bore and stroke of the Jackson model 348?

3—What is the horsepower?

4—Publish diagram of oiling system.

5—Is a good make of engine used in the Jackson eight-cylinder car?—F. Englert, Gurley, Neb.

1—No.

2—2.875 by 4.75.

3—26.48 N. A. C. C. rating.

4—This is shown in Fig. 12.

5—The Jackson eight-cylinder engine was designed by skilled men who no doubt considered as many things as the designers of other engines considered. The engine has given good service in the hands of the owners and ought to be considered as a good engine.

Engine in Mulford Car

Q—Was a Duesenberg engine used in the Mulford Special raced by Ralph Mulford? If so, publish the valve timing of same?—Roy M. Martin, Keokuk, Iowa.

Yes. The valve timing is not available, however.

Details of Gnome Engine

Q—How does the Gnome engine get its gasoline into the cylinder?

2—What type carbureter does it use?

3—What system of lubrication?

4—How does the airplane engine get its gasoline into the cylinders?—James L. Bostie, Malden, Mo.

1—The Gnome engine has the gasoline fed into the crankcase through a shut-off valve and through the hollow crankshaft to a spray nozzle in the crankcase. There is no throttle valve for carbureter. The gasoline in the tank is under about 5 lb. pressure. When the cylinders are within 20 deg. of the end of the inlet, a series of small holes around the circumference of the cylinder wall is uncovered by the piston, whereby the combustion chamber is put in communication with the crankcase.

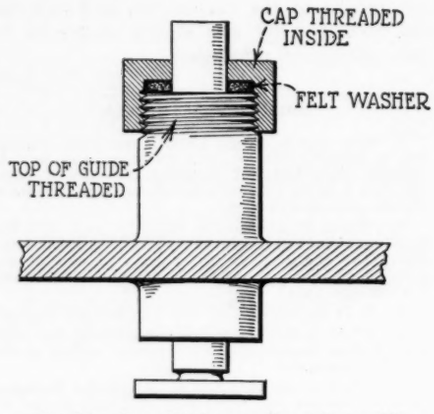


Fig. 11—Cap fitted over the valve guide to hold in place a felt washer

2—See 1.

3—The oil also is sprayed into the crankcase.

4—Ordinary airplane engines do not differ from motor car engines in this respect.

Noise at High Speed

Q—I have a big six Buick that clatters beyond 25 m.p.h. Is this the nature of the Buick? The car is in first class condition and has been run 20,000 miles.

2—Can I tell by testing gasoline with a gasoline tester whether or not it has been doped with ether? Is there anything else that will show lots of power besides ether?

3—What kind of a test can I make to show it?—H. J. Williams, Oceola, Ind.

1—It is the nature of any reciprocating engine to be slightly out of balance at some point of its own speed, although this trouble gradually is being reduced through careful designing and engineering. There are many things that will enter into the matter of balance, including proper adjustment of all parts, tightness of all nuts and bolts, correct valve and ignition timing and good carburetion. It may be there is some play in the crankshaft, or the engine may not be securely bolted to the frame of the car. After you have checked up on these points and have determined there is nothing wrong with the engine, go to the carbureter and work it down so you have as nearly complete and correct adjustment as possible. But first look for loose engine bolts. Only last week we saw a case of this sort and after a wrench had been applied to the bolts the excessive vibration and pounding disappeared.

2—Picric acid, but it is dangerous to use and will prove detrimental to the engine.

3—The only sure test would be a laboratory test, which means a chemical analysis.

Air Cleaners on Cars

Q—I recently noticed a query as to why air filters had not been installed on passenger cars. You advised that this was an unnecessary complication for there was not enough dust encountered in their use to warrant installation.

My experiences, I believe, will convince you that an air filter is a very necessary adjunct to the modern motor car. Last spring, when driveaways were in vogue I piloted two lots of cars from Detroit to Memphis. The first was an experimental trip with six cars in the convoy, and the second consisted of eighteen. On the arrival at Memphis it was necessary in every case to tighten the main and connecting rod bearings, replace the piston pins and their bushings, install new valve guides and valve tappets and guides. The engines were, also, unduly noisy, and an excessive amount of backlash was present in the timing gears.

There is no other explanation for this excessive wear other than the unusual amount of dust that was drawn into the cylinders, which acted as an abrasive and cut out the bearing surfaces. As the writer drove the pilot car, he knows that, at no time during the first 200 miles, did the car speed ever exceed 15 or 25 m.p.h. for the rest of the journey. In each case the pilot car was in much better condition than the remaining cars, and this is explained by the fact that, of course, it did not encounter as much dust. It will be argued that driveaway conditions are abnormal, and so they are, but it is also true that the dust taken into the engine of a car over a long period would result in an equal amount of wear. Your comment on these conditions will be greatly appreciated.

2—We are told how necessary it is to frequently replenish the oil supply in the engine, for the reason that the low-grade fuels now obtainable pass in part by the pistons and dilute the oil supply, in this manner losing its lubricating properties. Now if this is the condition, how did the little two-cycle marine engine stay lubricated when we put approximately a pint of oil to 5 gal. of gasoline? The particular engine the writer has in mind had no other means of lubrication, and it functioned properly without undue wear for several seasons.—Charles Godlon, Memphis, Tenn.

1—The need of an air cleaner on a motor car is not as great as it is on a tractor. A motor car is a faster moving vehicle and the dust which it creates by its passage is left behind before the car has a chance to become a part of the dust cloud. However, some dust is carried to vital parts where it should not go. An analysis of the carbon deposits found in the cylinder will show that more than half the deposit is road dust. The material in the oil which makes the oil black is not merely the carbon which is created by the combustion of the gasoline but also can be attributed largely to road dust, which a chemical analysis will show. A new car is subject to much more rapid wear for a while until the wearing surfaces adjust themselves. Driveaways impose extraordinary conditions upon a car, and when the road dust, which is small in

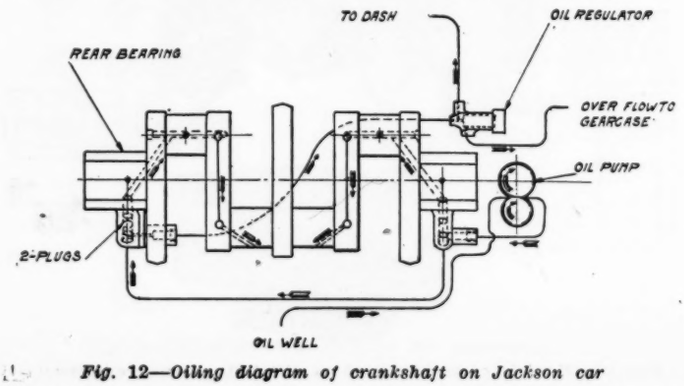


Fig. 12—Oiling diagram of crankshaft on Jackson car

amount, is drawn into the engine an abrasive action naturally is set up. When the wear tends toward an abnormal amount during ordinary conditions, the addition of dust makes it worse. Air filters require attention and, if not properly taken care of, can render a serious injury. When clogged or filled up with dust a sudden acceleration is likely to draw in a large amount of dust from the filter. So under ordinary conditions the air cleaner on the motor car is not considered of enough value to warrant installation.

2—This question has evoked much discussion. In a two-cycle engine there is drawn into the cylinder the mixture of gasoline and oil which previously has been compressed in the crankcase. The burning which takes place within the cylinder consumes the volatile gasoline, and the oil is left behind. In a four-cycle engine gasoline only is drawn into the cylinder. With the fuel that is used now, all the gasoline is not burned and the heavier parts condense. This is true in both the four-cycle and the two-cycle engines. In the case of the four-cycle this is a serious detriment because there is no oil in the gasoline and this raw gasoline finds its way to the crankcase, taking with it the oil splashed up on the cylinder walls and leaving a surface that is lubricated very poorly. In the two-cycle, however, there is always a quantity of oil drawn into the cylinder which when it drains down to the case leaves a surface that is lubricated, and no harm will result.

Play in Valve Stems

Q—What is the best way to overcome play of valve stems in the guides on the engine of a Hupmobile 32?

2—Do manufacturers usually carry valves with overside stem for cases of this kind?

3—How should they be installed, by boring out valve guide or cutting valve stem down to fit? They are not very loose but just enough that the valve can hit a little to one side when coming down.

4—Would this affect the power and speed of the machine or will the valve spring pull it into its seat quick enough to prevent loss of compression?—E. A. McCune, Carnegie, Pa.

1—Either by using the guide or by using valves with oversize stems. It may be possible to find some valves from a larger engine that can be turned down to fit the Hupmobile 32, but it will be necessary to have the stems at least 7½ in. long.

2—You can procure from the Hupp Motor Corp., Detroit, a set of valves that will do.

3—If you get oversize valves, you can ream out the guides just enough to true them up and then grind the valve stems to fit. If you cannot get the valves with oversize stems, you can use the old ones by reaming out the guides and inserting bronze bushings slightly smaller in inside diameter than the stems after they have been trued up in a lathe and have been ground to the same size for each, taking off only enough to make them true. Then ream out the bushing to fit the reground stems. The bushing should be pressed in, so as to be made secure, and it may also be held in place by using a small machine screw inserted in a tap hole that cuts between the cast-iron and the bushing. This will hold the bushing from turning and from working either up or down.

4—It is not so apt to affect the compression as it is the quality of the mixture, for play around the valve stems will admit air and an unequal amount if there is a difference in the several stems. Besides, it does not permit the springs to bring the valves to a seat as quickly as it should.

His Car Starts Hard

Q—On a cold morning the engine of my 1916 Maxwell 25 starts extremely hard. The compression is lax and the magneto gives off a fat spark. The batteries are in good condition. It starts readily when warmed up after running. In what does my trouble lie?

2—Excess oil gets past the piston and rings and I get bad oil mileage. The cylinders have bad and uneven compression and there is always an excess carbon deposit. The cylinders are not scored but the pistons and rings fit too loosely. Is it best to lap in new pistons or grind out the cylinders and fit new pistons and rings? Explain how to lap in new pistons.

3—Do rings have to be lapped in, or just fitted?

4—Can I obtain new oversize pistons at the Maxwell factory? If not, where can I get them?

5—Are the cylinders of this car offset from perpendicular with the crankshaft?—Morris Ferguson, Salt Lake City, Utah.

1—Leaky cylinders caused from carbonized rings and pitted valve seats seem to be your trouble.

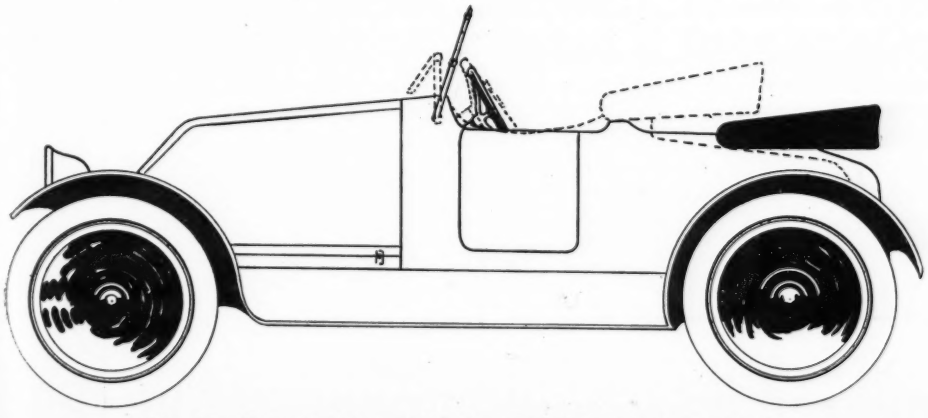


Fig. 13—Suggestion for converting Franklin into four-passenger

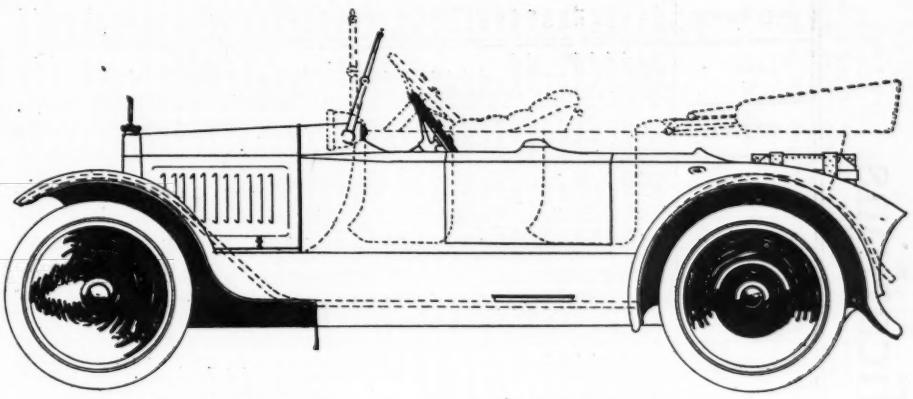


Fig. 14—Suggestion for changing Lozier 77 into a four-passenger

2—You say the cylinders are not scored. A score mark as faint as to be almost invisible is enough to let oil by. A scratch which cannot be felt by the finger will do the work. The piston rings are helping to do their share. If the pistons are too small, the Maxwell Co., Omaha, Neb., will supply you with new pistons which are made oversize.

3 and 4—New rings should be lapped in, and care taken to see that each ring finally gets into the groove that it was lapped to.

Rebuilding

Lozier Reconstruction

Q—Where is it possible to obtain a blueprint or sketch of a Lozier model 77, showing enough dimensions so that I can redesign the body?

2—Illustrate a body design for this car that would be pleasing when changed to a four-passenger touring car. Take into consideration the question of weight, eliminating weight wherever possible. Also add a pleasing design for trunk and luggage carrier.—F. Lloyd Mark, Chicago.

1—The Lozier company, as you probably know, is not manufacturing, neither is the H. A. L., so considering these things we do not think you can obtain a blueprint of the body giving its dimensions.

2—Our suggestion for this is seen in Fig. 14. It is suggested that this design be studied with dimensions that you can obtain by measuring the car itself. This will give you an idea of the scale of sizes and will help you to use to better advantage the materials now on the car.

Converting Franklin to Fourster

Q—Give suggestion for converting series eight Franklin roadster into a four-passenger car? Is it possible to lower the steering wheel? Is it possible to substitute the body of another make, such as the Chandler or Hudson, using the present hood? Where could this body be obtained?—Charles L. Foster, Alliance, Ohio.

Our suggestion for this conversion is shown in Fig. 13. The steering wheel can be lowered. It would not be worth while to try to fit a Hudson or Chandler body to this chassis, as special sills would have to be made and the body changed in many ways so that it could be accommodated to the Franklin chassis. It would be less expensive to have a body builder make a body to the required size and the style that you wish.

Making Speedster of Dodge

Q—Illustrate how a 1915 Dodge Brothers car may be cut down into a speedster.—R. F. Gilman, Philadelphia, Pa.

See the issue for Feb. 13. The same lines in general can be used, even though you may not want the top.

Motor Age Monthly Guide to Truck Specifications

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
A. & B., 3T	3	.....	48x3½d	48x3½d	Own	4-5 .17x4½	Bosch	none	none	Scheb.	none	Own	in-g.	Own	Gem.
A. & B., 5T	5	.....	48x3½d	48x5d	Own	4-5 .17x4½	Bosch	none	none	Scheb.	none	Own	in-g.	Own	Gem.
Acason, H	2	.....	36x4	36x7	Wauk.	4-4½x5½	Eise.	Nlite.	Wauk.	Scheb.	Muncie	Muncie	worm	Timkn.	Ross
Acason, L	3½	.....	36x5	36x5d	Wauk.	4-4½x6½	Eise.	Nlite.	Wauk.	Scheb.	Muncie	Muncie	worm	Timkn.	Ross
Acason, M	5	.....	36x6	40x6d	Wauk.	4-4½x6½	Eise.	Nlite.	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Acason, R	1	.....	36x3½	36x5	Wauk.	4-3½x5½	Eise.	none	Wauk.	Scheb.	Fuller	Fuller	worm	Timkn.	Lavn
Acason, Tractor	6	.....	36x4	36x7	Wauk.	4-4½x5½	Eise.	.....	Wauk.	Scheb.	Muncie	Muncie	worm	Timkn.	Ross
Acason, Tractor	10	.....	36x5	36x5d	Wauk.	4-4½x6½	Eise.	.....	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Acme, B	1	$1,950	34x3½	34x5	Cont.	4-3½x5	Eise.	G&D	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme, A	2	2,750	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme, C	3½	3,650	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme, E	5	4,750	36x6	40x6d	Cont.	4-4½x6	Eise.	.....	Cont.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Air-O-Flex, 188	2	.....	36x4	36x7	Cont.	4-4½x5½	A-K	Bijur*	Duplx.	Strom.	Hoosier	B-Lipe	in-g.	Russel	Lavn.
All American, AA	1	1,295	33x4*	32x4	H-S	4-3½x5	Dixie	none	none	Strom.	B.&B.	G-Lees	in-g.	Torbn.	Ross
American	2	.....	36x4	36x7	Buda	4-4½x5½	Eise.	West.	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
American	3½	.....	36x5	36x5d	Buda	4-4½x5½	Eise.	West.	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross.
American	5	.....	36x6	40x6d	Buda	4-4½x6	Eise.	West.	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Armleder, HW	2	.....	36x4	36x4d	Cont.	4-4½x5½	Eise.	none	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Armleder, KW	3½	.....	36x5	36x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Atlas, 19	½	1,135	32x4*	32x4*	Lyc.	4-3½x5	Remy	Remy*	.....	Carter	B-&B.	Own	d-rd.	Hess	Lavn.
Atterbury, 7R	1½	2,575	36x3½	36x5	Cont.	4-4½x5½	Eise.	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury, 7C	2	2,975	36x4	36x4d	Cont.	4-4½x5½	Eise.	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury, 7D	3½	3,875	36x5	40x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury, 8E	5	4,975	36x5	40x6d	Cont.	4-4½x6	Eise.	Delco	Cont.	Zenith*	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Autocar, XXI-F	2	2,050	34x4	34x5	Own	2-4½x4½	Bosch	none	none	Strom.	Own	Own	d-rd.	Own	Own
Autohorse, 10	5	2,100	34x10	.....	Cont.	4-3½x5	Koko.	none	opt.	Strom.	B.&B.	Det.	in-g.	Own	Own
Available, 1	1	2,250	36x3½	36x5	Cont.	4-3½x5	Bosch	.....	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Available, 2	2	2,950	36x4	36x6	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Available, 3	3½	4,200	36x5	40x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Available, 5	5	4,900	36x6	40x6d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Beck, A	1	1,550	34x3	34x4	Cont.	4-3½x5	.....	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Beck, B	1½	1,950	34x3½	34x5	Cont.	4-3½x5	Bosch	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Beck, C	2	2,250	36x3½	36x6	Cont.	4-	Bosch	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Beech Creek, 3A	3	3,850	36x6	36x6	Wauk.	4-4½x5½	Eise.	.....	Wauk.	King*	B.&B.	Own	bevel	Own	Own
Bessemer, G	1	1,450	34x3½	34x4	Cont.	4-3½x5	Split.	none	none	Zenith	Fuller	Fuller	in-g.	Torbn.	Ross
Bessemer, H	1½	1,945	36x3½	36x5	Cont.	4-3½x5	Split.	opt.	none	Zenith	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bessemer, J	2	2,490	36x4	36x4d	Cont.	4-4½x5½	Split.	opt.	Pierce	Ray.	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bessemer, K	3½	3,450	36x5	36x5d	Cont.	4-4½x5½	Split.	opt.	Pierce	Ray.	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bethlehem, D	1½	1,965	34x3½	34x5	N.A.	4-3½x4½	A-K	G&D*	Mon.	Scheb.	B.&B.	Det.	in-g.	Russel	Lavn.
Bethlehem, E	2½	2,365	34x4	34x6	N.A.	4-4 x4½	A-K	G&D*	Mon.	Scheb.	B.&B.	Det.	in-g.	Russel	Lavn.
Bethlehem, F	3½	3,465	34x4	34x5d	N.A.	4-4½x6	A-K	G&D*	Mon.	Scheb.	B.&B.	Det.	in-g.	Russel	Lavn.
Bourne, VM	2	3,500	36x4	36x8	Herc.	4-4 x5½	Eise.	Entz*	Simplx.	Zenith	Entz	Entz	worm	Timkn.	Ross
Bourne, XM	3½	4,200	36x5	36x10	Herc.	4-4½x5½	Eise.	Entz*	Simplx.	Zenith	Entz	Entz	worm	Timkn.	Ross
Brinton, H	1	1,500	33x4½*	33x4½*	Wis.	4-3½x5	.....	.....	none	.....	.....	.....	worm	.....	.....
Brinton, F	2½	3,000	36x4	36x6	Cont.	4-4½x5½	Bosch	.....	Pierce	.....	.....	.....	worm	.....	.....
Briscoe, 4-24	½	885	31x4*	31x4*	Own	4-3 7/8x5½	Conn.	A-L*	none	Buick	Own	Own	bevel	Own	Own
Briscoe, T-34	1	.....	33x4*	34x4	Own	4-3½x5	Conn.	A-L*	Own	Buick	Own	Own	in-g.	Russel	Lavn.
Brockway, J2	1½	2,450	36x3½	36x5	Cont.	4-3½x5	Eise.	none	none	Scheb.	Hart	B-Lipe	worm	Timkn.	Gem.
Brockway, S	1½	4,850	36x6	40x6d	Cont.	4-3½x5	Eise.	.....	Duplx.	Scheb.	B-Lipe	B-Lipe	worm	Shel.	Gem.
Brockway, K3	2	2,850	36x4	36x7	Cont.	4-4½x5½	Eise.	none	none	Scheb.	Hart	B-Lipe	worm	Timkn.	Gem.
Brockway, R	3½	3,750	36x5	36x5d	Cont.	4-4½x5½	Eise.	none	none	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Brockway, T	5	4,850	36x6	40x6d	Cont.	4-4½x6	Eise.	.....	Duplx.	Car.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Chase, A	1	1,725	36x3½	36x5	Wauk.	4-3½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Chase, C	1½	2,025	36x3½	36x6	Wauk.	4-3½x5½	Bosch	.....	Mon.	Strom.	B.&B.	Cotta	worm	Shel.	Lavn.
Chase, B	2½	2,475	36x4	36x4d	Buda	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Chase, X	3	2,800	36x4	36x5d	Buda	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Salsby.	Lavn.
Chase, O	3½	3,000	36x5	36x5d	Cont.	4-4½x5½	Bosch	Dneto.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Chevrolet, T	1	.....	31x4*	32x4	Own	4-3½x5½	Remy	A-L*	Mon.	Zenith	Own	Warner	worm	Ind.	Warn.
Clydesdale, 45	1½	.....	36x3½	36x5	Cont.	4-4½x5½	Lau.	.....	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.
Clydesdale, 65	2	.....	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.
Clydesdale, 90	3½	.....	36x5	40x5d	Cont.	4-4½x5½	Bosch	.....	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.
Clydesdale, 120B	5	.....	36x5	40x6d	Cont.	4-4½x6	Bosch	.....	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.
Collier, 16	1½	$1,375	33x4½*	33x4½*	Lyc.	4-3½x5	Conn.	A-L*	.....	.....	Zenith	B.&B.	G-Lees	worm	Chcgo.
Gabriel, E	2	3,250	36x4	36x7	Buda	4-4½x5½	Bosch	L-N*	Duplx.	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Gabriel, F	4	4,300	36x5	40x6d	Buda	4-4½x6	Bosch	L-N*	Duplx.	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Garford, 75-C	1	2,500	34x4½*	36x4	Buda	4-3½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Garford, 66-B	1½	3,000	36x3½	36x5	Buda	4-3½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Garford, 70-B	2	3,300	36x4	36x7	Buda	4-4½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Garford, 77-C	3½	4,300	36x5	40x5d	Wis.	4-4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Garford, 68	5	5,000	36x6	40x6d	Wis.	4-4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	chain	Own	Ross
Garford, 69	6	5,300	36x6	40x7d	Wis.	4-5 1/16x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	chain	Own	Ross
Garford Trac, 70-B	4½	3,400	36x4	36x7	Buda	4-4½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Garford Trac., 77	7	4,400	36x5	40x5d	Wis.	4-4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Gar. Trac., 68	10	5,100	36x6	40x6d	Wis.	4-5 1/16x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	B-Lipe	chain	Own	Ross
Gary, F	1	.....	36x3½	36x4	Cont.	4-3½x5	Eise.	Vesta	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, G	1½	.....	36x3½	36x5	Buda	4-4½x5½	Eise.	Vesta	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, H	2	.....	36x4	36x6	Buda	4-4½x5½	Eise.	Vesta	Simplx	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, HU	2½	.....	36x4	36x7	Buda	4-4½x5½	Eise.	Vesta	Simplx	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, K	3½	.....	36x5	36x5d	Buda	4-4½x6	Eise.	Vesta	Duplx.	Strom.	Warner	Warner	worm	Shel.	Lavn.
Gem	½	675	31x4*	31x4*	G.B.S.	4-3½x4½	Conn.	Dneto.*	.....	Car.	B.&B.	G-Lees	bevel	W-W.	Fost.
Geneva, 1	½	.....	34x2	36x2½	Beav.	2-5½x4½	Simms	.....	.....	Scheb.	Warner	.....	chain	Shel.	.....
Giant, 15	1	1,850	34x3½	34x5	Cont.	4-3½x5	Eise.	Det.	.....	Scheb.	Warner	Warner	worm	Timkn.	Jacx.
Giant, 14	1½	2,400	34x3½	34x5	Cont.	4-3½x5	Eise.	Det.	.....	Scheb.	Warner	Warner	worm	Timkn.	Jacx.
Giant, 16	2	2,850	36x4*	36x7*	Cont.	4-4½x5½	Eise.	Det.	.....	Scheb.	Warner	Warner	worm	Timkn.	Jacx.
Giant, 17	3½	3,850	36x5	36x5d	Cont.	4-4½x5½	Eise.	Det.	Pierce	Strom.	Warner	Warner	worm	Timkn.	Ross
Globe, A	1	1,490	34x3½	34x4	Cont.	4-3½x5	Eise.	.....	Pierce	Mast.	B.&B.	Cover	in-g.	Clark	Lavn.
Globe, B	1½	1,850	36x3½	36x5	Cont.	4-3½x5½	Eise.	.....	Pierce	Mast.	B.&B.	Cover	in-g.	Shel.	Lavn.
Globe, C	2	2,190	36x4	36x6	Cont.	4-4½x5½	Eise.	.....	Pierce	Mast.	B.&B.	Cover	in-g.	Clark	Lavn.
G. M. C., 16	½	1,495	35x5*	35x5*	Cont.	4-3½x5	Eise.	.....	Mon.	Own	Own	Own	bevel	Own	Own
G. M. C., 21	1	2,025	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 31	1½	2,395	36x3½	36x5	Cont.	4-3½x5	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 41	2	2,725	36x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 71	3½	3,750	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 101	5	4,350	36x6	40x6d	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Warner	worm	Timkn.	Lavn.
Gramm-B., W	1½	1,895	36x3½	36x5	Cont.	4-4½x5	N. E.	.....	none	Strom.	Fuller	Fuller	in-g.	Clark	Ross
Gramm-B., W	2	2,750	34x4	34x3½d	Wauk.	4-3½x5½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Gramm-B., W	2½	3,350	36x4	36x4d	Wauk.	4-4½x5½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Gramm-B., W	3½	4,000	36x5	40x5d	Wauk.	4-4½x5½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Gramm-B., W	5	5,000	36x6	40x6d	Wauk.	4-4½x6½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Grant, 12	½	1,125	32x4*	32x4*	H-S.	4-3½x5	Dixie	Bijur*	none	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Ditw.
Grant, 10	1½	1,885	34x4½*	34x5	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant, 11	1½	1,935	34x4½*	34x5	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant, 15	2	2,150	34x4	34x6	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant, 16	2	2,250	34x4	34x6	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Hahn, G	1	1,375	34x3	34x4	Cont.	4-3½x5	Eise.	.....	.....	Strom.	Det.	Det.	in-g.	Torbn.	Lavn.
Hahn, C	1½	1,950	36x3½	36x5	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Hahn, E	2½	2,500	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hall	2	2,675	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	3½	3,500	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	5	4,500	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	7	4,500	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	chain	Timkn.	Gem.
Harvey, WEA	1½	2,250	34x3½	34x5	Buda	4-4½x5½	Bosch	none	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Harvey, WFA	2½	3,000	36x4	36x7	Buda	4-4½x5½	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey, WHA	3½	3,900	36x5	36x5d	Buda	4-4½x6	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey WKA	5	5,000	36x6	40x6d	Buda	4-4½x6	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey Trac., HT	10	4,000	36x5	36x5d	Buda	4-4½x6	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Hawkeye, K	1½	1,900	34x3½	34x5	Buda	4-3½x5½	Eise.	Vesta	Simplx	Zenith	Fulier	Fuller	in-g.	Clark	Gem.
Hawkeye, M	2	2,650	36x4	36x6	Buda	4-4½x5½	Eise.	Vesta	Simplx	Zenith	Fuller	Fuller	in-g.	Clark	Gem.
Hendrickson	2	2,850	36x4	36x4d	Wauk.	4-4½x5½	Dixie	.....	Wauk.	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Hendrickson	3½	3,600	36x5	36x5d	Wauk.	4-4½x5½	Dixie	.....	Wauk.	Strom.	B.&B.	Cotta.	worm	Timkn.	Ross
Higrade, A17	½	1,850	35x5*	35x5*	Cont.	4-3½x5	Simms	L-N.*	Simplx	Zenith	Fuller	Fuller	worm	Shel.	Lavn.
Higrade, A18	1	2,100	35x5*	35x5*	Cont.	4-3½x5	Simms	L-N.*	Simplx	Zenith	Fuller	Fuller	worm	Shel.	Lavn.
Hoover, 15-B	1	1,435	32x4*	33x4½*	Cont.	4-3½x5	Spit.	none	.....	Scheb.	Fuller	Fuller	worm	Shel.	Lavn.
Hupmobile	½	1,350	33x4*	33x4*	Own	4-3½x5½	A-K.	West.	.....	Strom.	Own	Own	s-bev.	Own	Jacx.
Hurlburt	2	3,500	36x4	36x4d	Buda	4-4½x5½	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	.....
Hurlburt	3½	4,250	36x5	36x5d	Buda	4-4½x6	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	.....
Hurlburt	5	5,250	36x5	40x6d	Buda	4-4½x6	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	.....

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; **Ind.**, Industrial; Chcgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; **Emp.**, Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Columbia, F	1	1,750	32x3	32x4	Cont.	4-3½x5	Dixie	.....	Pierce	Shake.	B.&B.	Covert	in-g.	Russel	Own
Columbia, E	2	2,350	36x4	36x6	Cont.	4-4½x5½	Split.	Vesta	Pierce	Shake.	Hart	Covert	in-g.	Russel	Own
Columbia, T	6	2,350	36x4	36x6	Cont.	4-4½x5½	Split.	Vesta	Pierce	Shake.	Hart	Covert	in-g.	Russel	Own
Comet	1½	1,750	34x4	34x4	Lyc.	4-3½x5	Delco	Dneto.	.....	Carter	B.&B.	Muncie	worm	Chgo.	CAS.
Commerce, E	1	1,500	34x3	34x4	Cont	4-3½x5	Split.	Bijur*	none	Zenith*	Det.	Det.	in-g.	Torbn.	Jacx.
Commerce, EP	2	1,895	36x6	36x6	Cont.	4-4½x5	Split.	Bijur*	none	Zenith*	Det.	Det.	in-g.	Russel	Own
Concord, A	1½	2,550	36x3½	36x5	Buda	4-3½x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Concord, B	2½	3,000	36x4	36x4d	Buda	4-4½x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Corbitt, E	1	2,000	34x3½	34x4	Cont.	4-3½x5	Fise.	Disco*	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Corbitt, D	1½	2,400	36x3½	36x5	Cont.	4-3½x5	Eise.	Disco*	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Ross
Corbitt, C	2	3,000	36x4	36x7	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Corbitt, B	2½	3,200	36x4	36x7	Cont.	4-4½x5½	Fise.	none	Pier	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Corbitt, A	3½	4,000	36x5	36x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	H-Shaw	Cotta	worm	Sncl.	Ross
Corbitt, AA	5	4,500	36x6	40x6d	Cont.	4-4½x6	Fise.	none	Pierce	Strom.	H-Snaw	Cotta	worm	Shel.	Ross
Corliss, A	¾	800*	31x4*	31x4*	Mil.	4-3½x4½	Split.	.....	.....	Scheb.	.....	.....	bevel	.....	.....
Couple-Gear, HO	3½	6,000	36x4d	36x4d	Cont.	4-4½x6	Eise.	.....	.....	Strom.	.....	.....	bevel	Own	Own
Couple-Gear, AO	5	6,600	36x5d	36x5d	Wis.	4-5½x7	Fise.	.....	.....	Strom.	.....	.....	bevel	Own	Own
Croce, 17	½	825	32x4*	32x4	Wis.	4-3½x5	Bosch	.....	.....	Zenith	B-Lipe	B-Lipe	bevel	Timkn.	Lavn.
Dart, E	1	2,100	34x3½	34x5	Dart	4-3½x5½	Eise.	Bijur*	none	Zenith*	Fuller	Fuller	worm	Timkn.	Ross
Dart, CC4	2	2,950	36x4	36x7	Buda	4-4½x5½	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Timkn.	Ross
Dart, L	3½	4,000	36x5	36x10	Buda	4-4½x6	Eise.	Bijur*	Pierce	Zenith	Warner	Warner	worm	Timkn.	Ross
D-E, J	¾	1,050	33x4*	33x4*	LeR	4-3½x4½	Berl.	Al-Ch*	.....	Scheb.	Det.	Det.	worm	Shel.	Gem.
D-E, J	1	1,775	34x3	34x4	Cont.	4-3½x5	Berl.	.....	.....	Zenith	B.&B.	Covert	worm	Wis.	Ross
D-E, A	1½	2,075	34x3½	34x5	Cont.	4-3½x5	Berl.	.....	.....	Zenith	B.&B.	Covert	worm	Wis.	Ross
D-E, B	2	2,450	36x4	36x6	Cont.	4-4½x5½	Berl.	.....	.....	Zenith	B.&B.	Covert	worm	Wis.	Ross
D-E, D	2½	2,750	36x4	36x7	Buda	4-4½x5½	Berl.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
D-E, C	5	4,500	30x5	40x6d	Buda	4-4½x6	Berl.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Wis.	Ross
D-E, E	3½	3,350	36x5	36x5d	Cont.	4-4½x5.	Berl.	.....	Mon.	Strom.	B.&B	G-Lees	in-g.	Torbn.	Own
D-E, F	1½	1,795	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Mon.	Strom.	B.&B	G-Lees	in-g.	Torbn.	Own
Defiance, B	2	1,995	34x3½	34x6	Cont.	4-4½x5	Eise.	.....	Mon.	Strom.	B.&B.	Covert	in-g.	Torbn.	Wol.
Defiance, C	3½	3,500	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	Strom.	B.&B.	Covert	in-g.	Timkn.	Ross
Defiance, D	2	2,100	34x3½	36x5	Cont.	4-4½x5½	Eise.	none	none	Master	Fuller	Covert	worm	Timkn.	Ross
DeKalb, E-2	2½	2,600	36x4	36x6	Cont.	4-4½x5½	Eise.	none	none	Master	Fuller	Fuller	worm	Russel	Ross
DeKalb, E-2½	1	1,650	34x3	34x4	Cont.	4-3½x5	Eise.	Bijur*	Mon.	Strom.	Det.	Det.	in-g.	Russel	Gem
Denby, 12	2	2,350	36x3½	36x6	Cont.	4-3½x5	Eise.	Bijur*	Mon.	Strom.	Det.	Det.	in-g.	Russel	Gem
Denby, 13	3	3,000	36x4	36x7	Cont.	4-4½x5½	Eise.	Bijur*	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem
Denby, 25	3½	4,150	36x5	36x10	Cont.	4-4½x5½	Eise.	.....	Duplx.	Strom.	Own	Warner	in-g.	Clark	Ross
Denby, 27	5	4,900	36x6	40x12	Cont.	4-4½x5½	Eise.	.....	Duplx.	Strom.	Own	Warner	in-g.	Clark	Ross
Denby, 210	1	2,125	36x3	36x4	Cont.	4-3½x5	Bosch	none	Pierce	Strom.	B-Lipe	B Lipe	worm	Timkn.	Gem.
Diamond-T, J5	1½	2,550	36x3½	36x5	Cont.	4-3½x5	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Diamond-T, J4	2	2,925	36x4	36x7	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Diamond-T, J3	3½	4,150	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Diamond-T, LB	5½	4,950	36x6	40x6d	Cont.	4-4½x5½	Bosch	none	Wauk.	Master	B-Lipe	.....	chain	Own	Lavn.
Diamond-T, R	6	5,650	36x6	40x6d	Wauk.	4-4½x6½	Bosch	West.*	Own	Strom.	Warner	Warner	worm	Timkn.	Ross
Doane, 1919	2	2,985	36x4	36x7	Own	4-4½x5½	Bosch	A-L	Pierce	Scheb.*	B.&B.	G-Lees	in-g.	Torbn.	Ross
Dorris, K4	1	2,000	34x3½	34x5	Buda	4-4½x5	Eise.	opt.	Duplx.	Sneb.*	B-Lipe	B-Lipe	in-g.	Own	Lavn.
Douglas, TA	3½	4,000	36x6	36x6	Buda	4-4½x5½	Eise.	.....	Dneto.*	none	Carter	Mech.	Mech.	bevel	Gemco
Duplex, E	½	855*	30x3½*	30x3½*	Lyc.	4-3½x5	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ellsworth, 25A	¾	3,300	34x4	36x7	Wauk.	4-4 x5½	Dixie	.....	Wauk.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Fageol	2	2,200	36x4	36x6	Cont.	4-3½x5	Bosch	none	Mon.	Ray.	Fuller	Fuller	in-g.	Russel	Jacx.
Fargo, P	2	1,900	34x3	34x4	Cont.	4-3½x5	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, S	1	2,350	36x3½	36x5	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, T	2½	2,600	36x4	36x7	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, U	3	2,500	36x3½	36x5	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, Trac	3½	3,350	36x5	36x5d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, W	5	4,400	36x6	40x6d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, X	7	3,475	36x5	36x5d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	Det.	.....	worm	Shel.	Ross
Federal, Trac	¾	1,535	32x2½	32x3	LeR.	4-3½x4½	Dixie	.....	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	1	2,000	34x3	34x4	Cont.	4-3½x5	Bosch	.....	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	1½	2,375	34x3½	34x5	Cont.	4-3½x5	Bosch	.....	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	2	2,750	34x4	34x6	Contl	4-4½x5½	Bosch	.....	Pierce	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	1	550	30x3½	32x3½	Own	4-3½x4	Own	.....	.....	Own	Own	Own	worm	Own	Ross
Ford, TT	3	4,900	36x6	36x6	Wis.	4-4½x5½	Eise.	.....	Pierce	Strom.	M&E	Cotta	bevel	Own	Ross
F.W.D., B	1½	1,850	34x3½	34x5	H-S	4-3⅜x5⅞	Simms	.....	Pierce	Carter	B.&B.	Own	in-g.	Russel	Lavn.
Fulton, FX	1	2,000	35x5*	35x5*	Buda	4-3½x5	Bosch	L-N*	none	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Gabriel,* C	¾	1,550	36x3	36x3½	Own	4-3½x5½	Bosch	N-E.*	Own	Holl.	Own	Own	in-g.	Own	Lavn.
I. H. C., H	1	1,850	36x3½	36x4	Own	4-3½x5½	Bosch	N-E.*	Own	Holl.	Own	Own	in-g.	Own	Lavn.
I. H. C., F	1½	2,200	36x3½	36x5	Own	4-3½x5½	Bosch	N-E.*	Own	Holl.	Own	Own	in-g.	Own	Ross
I. H. C., K	2	2,600	36x4	36x6	Own	4-4 x5	Split.	N-E.*	Own	Ens.*	Own	Own	in-g.	Own	Ross
I. H. C., G	1	1,485	36x2	36x4	Cont.	4-3½x5	Eise.	Lesco.	Mon.	Marvel	B-Lipe	B-Lipe	worm	Chgo.	Lavn.
Independent, F	2	2,250	36x3½	36x5	Cont.	4-4½x5½	Eise.	none	Mon.	Marvel	.....	.....	worm	.....	.....
Independent, G	1	2,150	34x3½	34x4	Wauk.	4-3½x5½	Eise.	West.*	Wauk.	Strom.	B.&B.	Covert	worm	Own	Wol.
Indiana, T	2	2,600	36x3½	36x5	Ruten	4-4½x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana, Q	2	2,800	36x4	36x7	Ruten	4-4½x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana, D	3½	3,450	36x5	36x5d	Ruten	4-4½x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana, R	5	4,600	36x5	40x6d	Wauk.	4-4½x6½	Eise.	West.	Wauk.	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana, L	2	2,500	36x4	36x7	Buda	4-4½x5½	Eise.	none	Duplx.	Zenith	Fuller	Fuller	in-g.	Clark	Jacx.
Jumbo, A	¾	850	30x3½*	30x3½*	Lyc.	4-3½x5	Conn.	Dneto.*	none	Carter	Mech.	Mech.	bevel	Peru	Lavn.
Kearns	1½	1,800	34x3½	34x5	H-S.	4-3½x5	Berl.	none	none	.....	B.&B.	G-Lees	.....	Hayes	.....
Kearns	1½	2,750	36x3½	36x6	Own	4-3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	chain	Own	Gem.
Kelly-S., K-31	1½	2,750	36x3½	36x6	Own	4-3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	worm	Own	Gem.
Kelly-S., K-32	2½	3,250	36x4	36x4d	Own	4-3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	chain	Own	Gem.
Kelly-S., K-35	2½	3,250	36x4	36x4d	Own	4-3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	worm	Own	Gem.
Kelly-S., K-36	3½	4,250	36x5	40x5d	Own	4-4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kelly-S., K-40	4	4,400	36x5	40x6d	Own	4-4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kelly-S., K-45	5	4,900	36x6	40x6d	Own	4-4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kelly-S, K-50	6	5,200	36x6	40x7d	Own	4-4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kelly-S., K-60	1½	.....	36x3½	36x5	Wis.	4-4 x5	Eise.	.....	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, 2A	2	.....	36x4	36x6	Wis.	4-4 x6	Eise.	.....	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, 4A	2½	.....	36x4	36x7	Wis.	4-4½x6	Eise.	.....	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, 6A	4	.....	36x5	40x5d	Wis.	4-4½x5½	Eise.	.....	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, 8A	5	.....	36x6	40x6d	Wis.	4-5 .1x5½	Eise.	.....	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Jacx.
Kimball, 10A	1½	2,073	34x3½	34x5	Own	4-3½x5½	Eise.	*	Pierce	Strom.	Warner	Warner	worm	Timkn.	Lavn.
Kissel	2	2,832	34x4	36x7	Own	4-4½x5½	Eise.	*	Pierce	Strom.	Warner	Warner	worm	Shel.	Ross
Kissel	3½	3,905	36x5	36x5d	Own	4-4½x5½	Eise.	*	Pierce	Strom.	Warner	Warner	worm	Shel.	Ross
Kissel	5	4,785	36x6	36x6d	Own	4-4½x5½	Eise.	*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Kleiber, AA	1	2,400	34x3½	34x5	Cont.	4-3½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Shel.	Ross
Kleiber, A	1½	2,650	36x3½	36x6	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, BB	2	2,950	36x4	36x3½d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Shel.	Ross
Kleiber, B	2½	3,500	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, C	3½	4,100	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, D	5	5,100	36x6	40x6d	Cont.	4-5½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Knox, 35	10	5,500	36x4	38x6d	Own	4-5 x5½	Eise.	Bijur.*	none	Zenith*	Own	Own	chain	Timkn.	Ross
Knox, 36	10	6,000	36x4	38x6d	Own	4-5 x5½	Eise.	Bijur.*	none	Zenith*	Own	Own	chain	Timkn.	Ross
Koehler, K	1½	1,450	34x3	34x4	Own	4-3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, L	2½	1,985	34x4	34x6	Own	4-3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, M	2½	2,965	36x4	36x7	Own	4-4x5	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Own
Koehler Trac.,KT	3	1,750	34x3	34x5	Own	4-3½x5	Eise.	none	Mon.	Strom.	Mech,	Mech.	in-g.	Torbn.	Own
Koehler, O	3½	3,400	36x5	36x5d	Own	4-4½x5	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Own
Koehler Trac., LT	5	2,165	34x4	34x6	Own	4-3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, R	5	4,200	36x6	36x6	Own	4-5x6	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Own
LaFrance, 2-A	2	3,350	36x4	36x7	Cont.	4-4½x5½	Conn.	Dneto.*	Simplx.	Zenith	B.&B.	B-Lipe	worm	Timkn.	Ross
Lane, G	1½	2,250	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Pierce	Strom.	B.&B.	Cover	worm	Timkn.	Ross
Lane, H	2½	2,850	34x4	36x6	Cont.	6-3½x5½	Eise.	.....	Pierce	Strom.	B.&B.	Cover	worm	Shel.	Ross
Lane, K	3½	3,700	36x5	36x5d	Cont.	6-3½x5½	Eise.	.....	Pierce	Strom.	H-Shaw	Own	chain	Own	Gem.
Lange, B	2	2,950	36x4	36x6	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	Fuller	Fuller	in-g.	Torbn.	Ross
Lapeer Trac., 3	3	1,650	34x3½	34x5	Wauk.	4-3½x5½	Dixie	.....	Wauk.	Stew.	Fuller	Fuller	in-g.	Torbn.	Ross
Lapeer Trac., 5	5	2,200	34x3½	34x3½d	Wauk.	4-3½x5½	Dixie	.....	Wauk.	Stew.	Fuller	Fuller	worm	Shel.	Lavn.
Larrabee, M	1	1,950	34x3½	34x5	Cont	4-3½x5	Bosch	.....	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Ross
Larrabee, C-D	2½	3,000	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, A	3½	3,950	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, T	5	4,750	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Lippard-St., C	¾	1,900	35x4½*	35x4½*	Cont.	4-3½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	s-bev.	Timkn.	Ross
Lippard-St., H	1	2,250	36x3	36x5	Cont.	4-3½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	worm	Timkn.	Ross
Lippard-St., F	1½	2,750	36x3½	36x3d	Cont.	4-4½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	worm	Timkn.	Ross
Lippard-St., G	2	3,050	36x4	36x4d	Cont.	4-4½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	worm	Timkn.	Ross
Lombard, 5	.....	.....	.....	.....	.....	6-5½x7	.....	.....	.....	Strom.	.....	.....	worm	.....	.....
Loyal	¾	835	32x4*	32x4*	H-S.	4-3½x5	A-K.	*	.....	Strom.	B.&B.	Cover	in-g.	Torbn.	.....
Loyal	¾	950	32x4*	32x4*	H-S.	4-3½x5	A-K.	*	.....	Strom.	B.&B.	Cover	in-g.	Torbn.	.....
Maccar, L	1½	2,750	36x4	36x5	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nhte, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Motor Age Monthly Motor Truck Specifications—Concluded

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Maccar, H	2½	3,300	36x4	36x4d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Maccar, M	3½	4,100	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Maccar, U	5½	5,000	36x5	40x6d	Wis.	4-5 1x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Mack, AB	1	2,400	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Mack, AB	1	2,400	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	opt.	B-Lipe	B-Lipe	chain	Own	Gem.
Mack, AB	1½	2,800	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AB	1½	2,800	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	chain	Timkn.	Gem.
Mack, AB	2	3,000	36x4	36x4d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AB	2	3,000	36x4	36x4d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	chain	Own	Gem.
Mack, AB	5	.....	36x4	36x4d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	chain	Own	Gem.
Mack, AC	3½	4,600	36x5	40x5d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	.....	Gem.
Mack, AC	5½	5,250	36x6	40x6d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack Trac., AC	7	4,600	36x5	40x5d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack, AC	7½	5,500	36x7	40x7d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack Trac., AC	11	5,250	36x6	40x6d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack Trac., AC	15	5,500	36x7	40x7d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Manly, 30	1½	2,050	36x4	36x5	Wauk.	4-3½x5½	Eise.	.....	Wauk.	Zenith*	.....	.....	worm	.....	.....
Manly, 40	2	2,350	36x4	36x6	Wauk.	4-3½x5½	Eise.	.....	Wauk.	Zenith*	.....	.....	worm	.....	.....
Manly, 50	2½	2,800	36x4	40x7	Wauk.	4-4 x5½	Eise.	.....	Wauk.	Zenith*	.....	.....	worm	.....	.....
Master, JI	1½	1,890	34x3½	34x5	Buda	4-4½x5½	Eise.	opt.	McCan.	.....	Fuller	Fuller	in-g.	Torbn.	Wol.
Master, JW	1½	1,890	34x3½	34x5	Buda	4-4½x5½	Eise.	opt.	McCan.	.....	Fuller	Fuller	worm	Timkn.	Wol.
Master, M	2	2,390	34x4	36x7	Buda	4-4½x5½	Eise.	West.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Wol.
Master, O	2	2,490	34x4	36x7	Buda	4-4½x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Wol.
Master, W	2	2,590	34x4	36x7	Buda	4-4½x5½	Eise.	West.*	McCan.	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Wol.
Master, WL	2	2,690	34x4	36x7	Buda	4-4½x5½	Eise.	West.*	McCan.	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Wol.
Master, A	3½	3,890	36x5	40x5d	Buda	4-4½x6	Eise.	West.	Pierce	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Master, B	5	4,890	36x6	40x6d	Buda	4-4½x6	Eise.	.....	Pierce	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Maxfer	1	1,195	36x4*	34x4	.....	4-3½x5	Delco	Delco*	.....	.....	.....	.....	worm	.....	.....
Maxwell	1	1,085	32x3	32x4	Own	4-3½x4½	A-K.	A-L.	Own	John.	Own	Own	worm	Own	Own
Menominee	1	1,890	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, H	1½	2,475	36x3½	36x5	Cont.	4-3½x5½	Eise.	.....	Mon.	.....	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, D	2	2,950	36x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Mon.	.....	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, G	3½	3,880	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	.....	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, J	5	4,950	36x6	40x6d	Cont.	4-4½x5½	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Timkn.	Gem.
Modern, 30		1,800	34x3½	34x5	Cont.	4-3½x5	.....	.....	Mon.	.....	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Moreland, 17-N	1	2,175	34x3½	34x4	Cont.	4-3½x5	.....	.....	opt.	Zenith	Fuller	Fuller	worm	Timkn.	Ross.
Moreland, 17-B	1½	2,930	36x3½	36x5	Cont.	4-4½x5½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross.
Moreland, 17-C	2½	3,775	36x4	36x7	Cont.	4-4½x5½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross
Moreland, 17-G	4	4,850	36x5	40x5d	Wauk	4-4½x6½	Dixie	.....	Wauk.	Miller	Own	Own	worm	Timkn.	Ross
Moreland, 17-J	5	5,250	36x6	40x6d	Wauk.	4-4½x6½	Dixie	.....	Wauk.	Miller	Own	Own	worm	Timkn.	Ross
Muskegon, 20	2	2,325	36x4	36x6	Cont.	4-4½x5½	Eise.	none	Pierce	Stew.	Fuller	Fuller	in-g.	Torbn.	Lavn.
Mutual	2	.....	36x4	36x4d	Wis.	4-4½x6	Bosch	Vesta	Duplx.	Strom.	H-Shaw	Fuller	worm	Wis.	Ross
Mutual	3½	.....	36x5	40x5d	Wis.	4-4½x5½	Bosch	Vesta	Duplx.	Strom.	H-Shaw	Warner	worm	Wis.	Ross
Mutual	5	.....	36x6	40x6d	Wis.	5.1x5½	Bosch	Vesta	Duplx.	Strom,	H-Shaw	Warner	worm	Wis.	Ross
Myers, 50	1	1,495	34x4	34x4	Lyc.	4-3½x5	Delco	Dneto.	Pierce	Car.*	Mech.	Mech.	worm	Emp.	C.A.S
Myers, 55	1	1,460	34x3½	34x4	Lyc.	4-3½x5	Delco	.....	Pierce	Car.*	Mech.	Mech.	worm	Emp.	C.A.S
Myers, 70	1½	1,750	34x3½	34x5	Lyc.	4-3½x5	Delco	Dneto.*	Pierce	Car.*	B.&B.	G-Lees	worm	Emp.	C.A.S
Myers, 75	1½	1,700	34x3½	34x5	Lyc.	4-3½x5	Delco	Dneto.*	Pierce	Car.*	B.&B.	G-Lees	worm	Emp.	C.A.S
Nash, 2018	1	1,650	34x3	34x4	Own	4-3½x5½	Conn.	A-L.*	Duplx.	Strom.	B.&B.	Det.	in-g.	Clark	Jacox.
Nash, 4017	2	3,250	36x5	36x5	Buda	4-4½x5½	Eise.	Bijur*	Duplx.	Strom.	B.&B.	Own	in-g.	Own	Lavn.
Nash, 3018	2	2,175	34x4	36x5	Own	4-3½x5½	Conn.	A-L.*	Duplx.	Strom.	B.&B.	Det.	in-g.	Clark	Jacox.
Nelson & LeM., F	1	2,000	36x3	36x4	Cont.	4-3½x5½	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM., F2	2	2,775	36x4	36x7	Cont.	4-4½x5½	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM., F	3½	3,750	36x5	36x5d	Cont.	4-4½x5½	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM	5	4,750	36x6	40x6d	Buda	4-4½x6	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Netco, D	2	3,000	36x4	36x6	Cont.	4-4½x5½	Eise.	none	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Niles, B	1	1,500	35x5*	35x5*	Cont.	4-3½x5	Eise.	.....	Pierce	Strom.	Cover	Cover	worm	Timkn.	Gem.
Niles, E	2	2,400	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	B.&B.	Cover	worm	Timkn.	Gem.
Noble, NW2	2½	2,675	36x4	36x7	Cont.	4-4½x5½	Eise.	Remy.	Pierce	Strom.	B.&B.	Fuller	worm	Shel.	Ross
Noble, NW4	4	3,750	36x5	36x5d	Cont.	4-4½x5½	Eise.	Remy.	Pierce	Strom.	B.&B.	Fuller	worm	Shel.	Ross
Norwalk, 2000	1	.....	34x4*	34x4*	Lyc.	4-3½x5	Delco	Dneto.*	none	Car.*	B.&B.	G-Lees	worm	Emp.	C.A.S.
Norwalk, 3000	1½	.....	34x4	34x5	Lyc.	4-3½x5	Delco	Dneto.*	none	Car.*	B.&B.	G-Lees	worm	Stand.	C.A.S.
Ogden	1	.....	36x3	36x4	Cont.	4-3¾x5	Bosch	.....	Pierce	Ray.	.....	B-Lipe	worm	Timkn	Gem.
O. K., 1½T	1½	2,450	36x4	36x5	Buda	4-4¼x5½	Eise.	none	Pierce	Zenith	Muncie	Muncie	worm	Chgo.	Ross

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Royal	7	6,500	36x7	40x7d	Wis.	4-5½x7	Bosch	opt.*	Mon.	Strom.	H-Shaw	Own	worm	Timkn.	Ross
Rush, D	½	895	31x4	31x4	Cont.	4-3½x5	Conn.	Split.*	. .	Carter	B.&B.	.....	bevel	Own	Lavn.
Sandow, G	1	1,795	34x3	34x5	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuller	worm	Shel.	Ross
Sandow, CG	1½	2,090	34x3	34x5	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuller	worm	Shel.	Ross
Sandow, H	1½	2,375	34x4	34x6	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuller	worm	Timkn.	Ross
Sandow, J	2	2,975	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sandow	2	2,650	36x4	36x6	Cont.	4-3½x5	Eise.	.....	.....	Strom.	Fuller	Fuller	worm	Shel.	Ross
Sandow, K	2½	3,995	36x5	36x5d	Cont.	4-4½x5	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sandow, L	5	4 775	36x6	40x6d	Cont.	4-4½x6	Bosch	.....	Cont.	St.om.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sanford, 25	2½	3,900	36x4	36x4d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B.&B.	Det.	worm	Shel.	Ross
Sanford, 35	3½	3,975	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B.&B.	Warner	worm	Shel.	Ross
Sanford, 50	5	4,750	36x5	36x6d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B.&B.	Warner	worm	Shel.	Ross
Schacht	2	3,150	36x4	36x7	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schacht	2½	3,500	36x4	36x4d	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schacht	3½	3,950	36x5	36x5d	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schacht	5	4,950	36x5	40x6d	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schleicher	3	3,675	34x4½	34x3½d	Cont.	4-4½x5½	Bosch	.....	opt.	Strom.	.....	Own	chain	Own	.....
Schleicher	5	4,725	34x5	34x4d	Cont.	4-5 x6	Bosch	.....	.....	Strom.	.....	Own	chain	Own	.....
Selden, TXR	1	2,000	34x3½	34x5	Cont.	4-3½x5	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Russel	Lavn.
Selden, TWL	1	2,200	34x3	34x4	Cont.	4-3½x5	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Selden, TXL	1	1,650	34x3½	34x5	Cont.	4-3½x5	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Russel	Lavn.
Selden, JCB	2	2,850	36x4	36x7	Cont.	4-4½x5½	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Russel	Jacx.
Selden, JWB	2	3,050	36x4	36x7	Cont.	4-4½x5½	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Jacx.
Selden, NL	3½	3,850	36x5	36x5d	Cont.	4-4½x5½	Eise.	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Selden, DL	5	6,000	36x6	40x12	Cont.	4-4½x5½	Eise.	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Seneca, J	½	.....	30x3½*	30x3½*	LeR.	4-3½x4½	Remy	A -Ch.*	none	Scheb.*	Det.	Det.	bevel	Adams	Ditw.
Service, 320	1	2,100	32x3½	34x5	Buda	4-3½x5½	Eise.	West.	none	Strom.*	Fuller	Fuller	worm	Timkn.	Ross
Service, 340	2	3,000	36x4	36x7	Buda	4-4½x5½	Eise.	West.	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 370	3½	3,900	36x5	36x5d	Buda	4-4½x5½	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 375	3½	4,200	36x5	36x5d	Buda	4-4½x6	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 400	5	5,000	36x6	40x6d	Buda	4-4½x6	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Shaw, M-3	2	2,700	36x4	36x6	Cont.	4-4½x5½	Bosch	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Signa , F	1	2,400	34x3½	36x5	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa , H	1½	2,700	34x4	36x6	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa , J	2	3,100	34x4	36x8	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa , M	3½	4,100	36x5	40x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa , R	5	5,100	36x6	40x6d	Cont.	4-4½x6	Eise.	none	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Standard, 76	2	2,800	36x4	36x6	Cont.	4-4½x5½	Eise.	none	Pierce	Scheb.	B.&B.	B-Lipe	worm	Timkn.	Ross
Standard, 66	3½	3,675	36x5	36x5d	Cont.	4-4½x5½	Eise.	none	Mon.	Strom.*	B.&B.	B-Lipe	worm	Timkn.	Gem.
Standard, 86	5	4,650	36x6	40x6d	Cont.	4-4½x5½	Eise.	none	Mon.	Strom.*	B.&B.	B-Lipe	worm	Timkn.	Gem.
Steele, C	2	2,500	38x5	40x4d	Cont.	4-4½x5½	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Steele, B	3	3,000	38x6	40x6d	Own	4-5 x5	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Steele, BA	4	3,500	38x6	40x5d	Own	4-5 x5	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Steele, A	5	4,000	38x7	40x6d	Own	4-5 x5	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Sterling	2½	3,300	36x4	36x4d	Own	4-4½x5½	Eise.	.....	Wauk.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Sterling	3½	4,325	36x5	40x5d	Own	4-4½x6½	Eise.	.....	Wauk.	Ray.*	H-Shaw	Own	worm	Timkn.	Ross
Sterling	5	5,100	36x6	40x6d	Own	4-4½x6½	Eise.	.....	Wauk.	Ray.*	H-Shaw	Own	worm	Timkn.	Ross
Sterling	7	5,600	36x6	40x7d	Own	4-4½x6½	Eise.	.....	Wauk.	Ray.*	H-Shaw	Own	chain	Own	Ross
Stewart, 6	¾	950	33x4*	33x4*	LeR.	4-3½x4½	Eise.	.....	Le Roi	Zenith	Mech.	Mech.	in-g.	Clark	CAS
Stewart, 8	1	1,575	34x3½	34x4	Cont.	4-3½x5	Eise.	.....	Mon.	Zenith	B.&B.	Fuller	in-g.	Clark	Gem.
Stewart, 9	1½	1,975	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Mon.	Zenith	Fuller	Fuller	in-g.	Clark	Gem.
Stewart, 7	2	2,575	34x4	34x4d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	Fuller	Fuller	in-g	Clark	Ross
Stewart, 10	3½	3,500	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	Fuller	Fuller	in-g	Clark	Ross
Sullivan, F	1½	2,350	36x3	36x5	Buda	4-3½x4½	Bosch	.....	.....	Strom.	Hart	Covert	worm	Timkn.	Ross
Sullivan, E	2	2,850	36x4	36x6	Buda	4-4½x5½	Bosch	.....	.....	Strom.*	B-Lipe	B-Lipe	worm	Timkn.	Ross
Superior, A	1	1,600	34x3½	34x4*	Own	4-3½x5	Eise.	none	Mon.	Strom.*	Fuller	Fuller	in-g.	Torbn.	CAS
Superior, C	2	2,200	36x4	36x6	Own	4-3½x5	Eise.	none	Mon.	Strom.*	Fuler	Fuller	in-g.	Torbn.	Ross
Texan	1½	1,375	34x4*	34x4	Lyc.	.....	.....	Dneto.*	.....	.....	.....	Muncie	worm	Chgo.	.....
Tiffin, A	¾	1,100	35x4½	35x4½*	Cont.	4-3½x5	Bosch	none	none	Scheb.	Det.	Det.	in-g.	Russe	Lavn.
Tiffin, GW	1½	2,125	36x3½	36x5	Cont.	4-3½x5½	Bosch	none	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Ross
Tiffin, MW	2½	2,850	36x4	36x3½d	Cont.	4-4½x5½	Bosch	none	Pierce	Scheb.	Hart	Covert	worm	Timkn.	Ross
Tiffin, PW	3½	3,760	36x5	36x5d	Cont.	4-4½x5½	Bosch	West.*	Pierce	Scheb.	B.&B.	Covert	worm	Shel.	Ross
Tiffin, RW	5	5,000	36x6	40x6d	Cont.	6-3½x5½	Bosch	West.	none	Scheb.	B.&B.	Covert	worm	Shel.	Ross
Tiffin, SW	6	5,200	36x6	40x12	Cont.	6-3½x5½	Bosch	West*	none	Scheb.	B.&B.	Covert	worm	Shel.	Ross

Abbreviations: Engine—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric Starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Tinkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chcgo., Chicago-Standard; Chgo., Chicago; W-W, Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

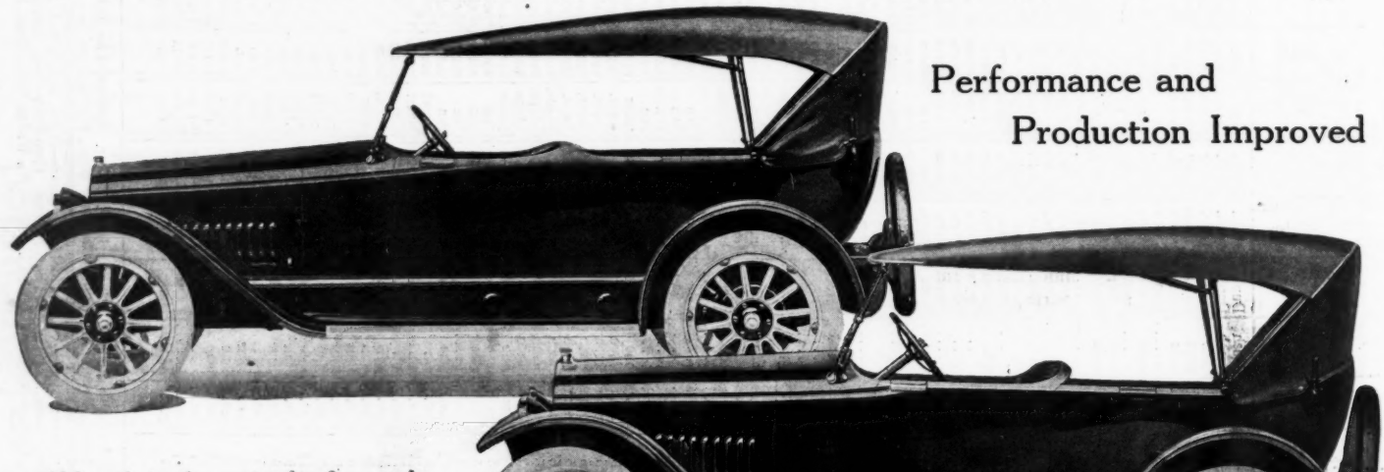
Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
O. K., 2T	2	2,650	36x4	36x5	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	Muncie	Muncie	worm	Chgo.	Ross
O. K., 3T	3	3,250	36x4	36x7	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	Fuller	Fuller	worm	Hays	Ross
Old Hickory, M		995	33x4*	33x4*	Lyc.	4-3½x5	Conn.	Dneto.*	.....	Car.	Lyc.	G-Lees	bevel	Salsby	C.A.S.
Old Rel'ble, W-15	1½	2,350	34x3½	36x6	Wis.	4-4 x5	Bosch	opt.	Mon.	Ray.*	B-Lipe	B-Lipe	worm	Shel.	Ross
Old Rel'ble, W-25	2½	3,250	36x4	36x4d	Wis.	4-4½x6	Bosch	opt.	Mon.	Ray.	Fuller	Fuller	worm	Shel.	Ross
Old Rel'ble, W-35	3½	4,000	36x5	36x5d	Wis.	4-4½x5½	Bosch	opt.	Mon.	Ray.	Univ	Savg.	worm	Shel.	Ross
Old Rel'ble, W-50	5	5,000	36x6	40x6d	Wis.	4-5.1x5½	Bosch	opt.	Duplx.	Strom.	Univ.	Savg.	chain	Shel.	Ross
Old Rel'ble, C-50	5	5,000	36x6	36x6d	Wauk.	4-4½x6½	Bosch	none	Wauk.	Strom.	Univ.	Savg.	chain	Shel.	Ross
Old Rel'ble, C-70	7	6,000	36x6	40x7d	Wauk.	4-4½x6½	Bosch	none	Wauk.	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, A	1	2,290	36x3½	36x5	Cont.	4-3½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, B	1½	2,650	36x3½	36x6	Cont.	4-4½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, C	2	3,000	36x4	36x7	Cont.	4-4½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, D	3½	3,700	36x5	36x5d	Cont.	4-4½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, E	5	4,750	3ox6	40x12	Cont.	4-5½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Overland, Panel		900	31x4*	31x4*	Own	4-3½x5	Conn.	A-L.*	.....	Till.*	Own	Own	bevel	Own	Own
Overland, Exp		900	31x4*	31x4*	Own	4-3½x5	Conn.	A-L.*	.....	Till.*	Own	Own	bevel	Own	Own
Overland		1,015	33x4½*	33x4½*	Own	4-4½x4½	Conn.	A-L.*	.....	Till.	Own	Own	s-bev.	Own	Own
Packard, E	1½	3,000	34x3½	34x3½d	Own	4-4 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	2	3,400	34x4	34x4d	Own	4-4 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	3	4,100	36x5	36x5d	Own	4-4½x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	4	4,450	35x5	40x5d	Own	4-4½x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	5	5,150	36x6	40x6d	Own	4-5 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	6	5,400	36x6	40x7d	Own	4-5 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Palmer	1	1,585	34x3½	34x4	Cont.	4-3¾x5	Bosch	.....	Pierce	Strom.	Fuller	Fuller	in-g.	Torbn.	Ross
Palmer	2	2,275	36x3½	36x4d	Cont.	4-4¼x5¼	Bosch	.....	Pierce	Strom.*	Fuller	Fuller	worm	Timkn.	Ross
Panhard, A	1	1,195	32x3½	32x3½	Gray	4-3½x5	A-L	A-L	.....	Strom.*	Fuller	Fuller	in-g.	Torbn.	Lavn.
Panhard, B	1½	1,395	32x3½	32x4	Gray	4-3½x5	A-L	A-L	.....	Strom.*	Fuller	Fuller	in-g.	Torbn	Lavn.
Panhard, E	2½	2,350	34x4	34x6	Buda	4-4½x5½	Eise.	opt.	Duplx.	Strom.	B-Lipe	Own	worm	Own	Ross
Parker	2	3,150	34x4	36x3½d	Cont.	o-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Parker	3	3,700	34x4	36x5d	Cont.	6-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Parker	4	4,250	36x5	40x5d	Cont.	6-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Parker	5	5,000	36x5	40x6d	Cont.	6-3½x5½	.....	.....	Pierce	Strom.*	.....	.....	.....	.....	.....
Patriot	1½	2,150	34x3½	34x5	Cont.	4-3½x5	.....	.....	Pierce	Strom.*	.....	.....	.....	.....	.....
Patriot	2½	3,150	34x4	34x7	Cont.	4-4½x5½	.....	.....	.....	Strom.	Own	Own	chain	Own	Own
Peerless, TC	3	4,125	36x4	40x4d	Own	4-4½x6½	Remy	none	Own	Strom.	Own	Own	chain	Own	Own
Peerless, TC	4	4,150	36x5	40x5d	Own	4-4½x6½	Remy	none	Own	Strom.	Own	Own	chain	Own	Own
Peerless, TC	5	4,700	36x6	40x6d	Own	4-4½x6½	Remy	none	Own	Strom.	Own	Own	worm	Own	Own
Pierce-Ar., X-4	2	3,750	36x4	36x4d	Own	4-4 x5½	Eise.	West.*	Own	Own	Own	Own	worm	Own	Own
Pierce-Ar., R-9	5	5,500	36x6	40x6d	Own	4-4½x6	Eise.	West.*	Own	Own	Own	Own	worm	Own	Own
Power	2	.....	36x4*	36x4d*	Cont.	4-4½x5½	Simms	.....	Pierce	King	Fuller	Fuller	worm	Timkn.	Ross
Rainier, R-5	2	1,550	34x4	34x4	Cont.	3-4½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Rainier, R-5	2½	1,250	33x4*	33x4*	Lgt.	4-3½x4½	Simms	none	none	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Rainier, R-2	2½	1,350	34x4*	34x4*	Lgt.	4-3½x4½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Hayes	Lavn.
Rainier, R-4	1½	1,595	33x4*	34x4	Lgt.	4-3½x4½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Chcgo.	Lavn.
Rainier, R-6	1½	1,890	34x3	34x4	Cont.	4-3½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Chcgo.	Lavn.
Rainier, R-8	2	2,250	34x4	34x6	Cont.	4-3½x5½	Split.	West.	Pierce	Strom.	Warner	Warner	worm	Hayes	Lavn.
Ren.-Leslie, M	2½	2,895	36x5	36x7	Buda	4-4½x5½	Split.	West.	Pierce	Strom.	Warner	Warner	worm	Hayes	Lavn.
Ren.-Les'ie, B	8	2,895	36x5	36x7	Buda	4-4½x5½	Split.	West.	Pierce	Strom.	Warner	Warner	worm	Hayes	Lavn.
Reo, F	3	1,250	34x4½*	34x4½*	Own	4-4½x4½	Remy	Remy*	none	John.	Own	Own	s-bev.	Own	Own
Republic, Desp	2½	1,095	32x3	32x3½	Own	4-3½x5	Remy	Remy	Rugles	Strom.	Own	Own	in-g.	Torbn.	Jacx.
Republic, 9 Sp	2½	1,295	32x3	32x4	Own	4-3½x5	Eise.	none	Rugles	Strom.	Own	Own	in-g.	Torbn.	Jacx.
Republic, 10	1	1,535	34x3	34x4	Cont.	4-3½x5	Eise.	none	Rugles	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 11X	1½	1,885	34x3½	34x5	Cont.	4-3½x5	Eise.	none	Rugles	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 19	2	2,395	34x4	34x6	Cont.	4-4½x5½	Bosch	none	Pharo	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 20	3½	3,450	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pharo	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Riker, B	3	.....	36x5	36x5d	Own	4-4½x6	Beri.	West.*	Own	Own	Own	Own	worm	Own	Ross
Riker, BB	4	.....	36x5	36x6d	Own	4-4½x6	Beri.	West.*	Own	Own	Own	Own	worm	Timkn.	Ross
Rowe, CDW	2	3,000	34x4	36x7	Wis.	4-4 x5	Bosch	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, CDW	2½	3,250	34x4	36x4d	Wis.	4-4 x5	Bosch	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, DEW	3	3,800	3ox5	36x5d	.....	4-4 x6	Bosch	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, GW	3	.....	38x7	42x9	H-S	.....	A-K	West.*	.....	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, FW	5	4,900	36x6	40x6d	Wis.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Royal	1	2,400	34x4	34x5	Wis.	4-3¾x5	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	1½	2,800	34x4	34x5	Wis.	4-3¾x5	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	2	3,200	36x4½	36x6	Wis.	4-4 x6	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	2½	3,500	36x4½	36x6	Wis.	4-4½x6	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	3½	4,200	36x5	38x5d	Wis.	4-4½x6	Bosch	opt.*	Mon.	Strom.	H-Shaw	Own	worm	Timkn.	Ross
Royal	5	5,000	36x6	40x6d	Wis.	4-4½x5½	Bosch	opt.*	Mon.	Strom.	H-Shaw	Own	worm	Timkn.	Ross
Royal	6	5,400	36x6	40x6d	Wis.	4-5½x6	Bosch	opt.*	Mon.	Strom.	H-Shaw	Own	worm	Timkn.	Ross

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Titan, T	3½	4,300	36x5	40x5d	Buda	4-4½x6	Bosch	Bosch	Duplx.	Strom.	B.&B.	Cotta	in-g.	Clark	Lavn.
Titan, H	6	5,150	36x6	40x6d	Buda	4-4½x6	Bosch	Bosch	Duplx.	Strom.	B.&B.	Cotta	in-g.	Clark	Lavn.
Tower, F	2	2,975	36x4	36x7	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Tower, G	3½	4,100	3ox5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Traffic	2	1.395	34x3	34x4	Gray	4-3½x5	Koko.	none	none	Carter	B.&B.	Cover.	in-g.	Russe.	Ditw.
Transport, N	5	2,750	34x3½	34x4d	.....	4-3½x5	Bosch	.....	Mon.	Zenith	.....	.....	worm	.....	.....
Triangle, A	1½	2,185	34x3½	34x6	Wauk.	4-3½x5½	Eise.	none	Wauk.	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Triangle, B	2½	2,850	36x4	36x7	Ruten	4-4½x5½	Eise.	.....	Pierce	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Union, B	2½	2,375	36x4	36x7	Cont.	4-4½x5½	Eise.	none	Duplx.	Scheb.	Fuller	Fuller	in-g.	Russel	Ross
Union, C	4	3,500	36x6	36x5d	Wis.	4-4½x6	Eise.	.....	.....	Scheb.	.....	Fuller	in-g.	Torbn.	.....
U. S., E	2½	2,800	34x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	Hart	Cotta	chain	Own	Lavn.
U. S., H	2½	3,250	34x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	Hart	B-Lipe	chain	Own	Lavn.
U. S., D	3½	3,500	3ox5	36x5d	Cont.	4-	Eise.	.....	Pierce	Strom.	Hart	B-Lipe	worm	Shel.	Lavn.
U. S., J	3½	3,950	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	.....	Strom.	B.&B.	B-Lipe	worm	Shel.	Lavn.
U. S., K	5	4,850	36x5	40x6d	Wauk.	4-4½x6½	Eise.	.....	Wauk.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
United, AX	1½	.....	36x3½	36x6	Buda	4-3½x5½	Eise.	opt.	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
United, BX	2½	.....	36x4	36x7	Buda	4-4½x5½	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
United, CX	3½	.....	36x5	36x5d	Buda	4-4½x6	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
United, VX	5	.....	36x5	40x6d	Buda	4-4½x6	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Universal, G	1½	.....	34x3½	34x5	Buda	4-3½x5½	Eise.	.....	Mon.	Zenith	Own	Own	worm	Own	Lavn.
Universal, D	2	.....	36x5	36x4d	Own	4-4½x5½	Eise.	.....	Mon.	Zenith	Own	Own	chain	Own	Lavn.
Universal, L	3½	.....	36x5	36x5d	Buda	4-4½x5½	Eise.	.....	Mon.	Zenith	Own	Own	chain	Own	Lavn.
Velie, 25B	2	2,950	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.*	B.&B.	B-Lipe	worm	Timkn.	Gem.
Velie, 26B	3½	3,900	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Vim, 21	½	945	31x4*	31x4*	Own	4-3 x4½	Split.	West.	.....	Zenith	Own	Own	bevel	.....	Jacx.
Vim, 25	1	2,195	34x3½	34x4	Herc.	4-3½x5½	Split.	.....	Duplx.	Zenith	.....	.....	worm	Shel.	Gem.
Vim, 22	2	3,150	36x4	36x6	Herc.	4-3½x5½	Split.	.....	Duplx.	Zenith	.....	B-Lipe	worm	Shel.	Gem.
Vim, 23	3	3,950	36x4	36x4d	Herc.	4-4½x5½	Split.	.....	Duplx.	Zenith	.....	B-Lipe	worm	Shel.	Gem.
Walter, MO	3	.....	40x4d	40x4d	Own	4-4½x6	.....	none	Own	Zenith	Own	Own	ext-g.	Own	Own
Walter, F	5	5,700	40x7	40x10	Own	4-4½x6½	Eise.	West.*	Own	H&N	Warner	Own	in-g.	Own	Own
Watson, Tractor	5	4,050	34x4	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Weir-Smith	3½	.....	37x7	37x7	Cont.	4-4½x5½	Dixie	.....	.....	Zenith	Fuller	Own	bevel	Own	Own
White, GBBE	¾	2,300	34x4½*	34x4½*	Own	4-3½x5½	.....	.....	none	Own	Own	Own	d-rd.	Own	Own
White, TBC	1½	3,300	36x4	36x7	Own	4-3½x5½	.....	.....	none	Own*	Own	Own	d-rd.	Own	Own
White, TJ	3	4,100	36x5	40x5d	Own	4-3½x5½	.....	.....	none	Own*	Own	Own	d-rd.	Own	Own
White, TG	5	5,000	36x6	40x6d	Own	4-4½x5½	.....	.....	none	Own*	Own	Own	d-rd.	Own	Own
White-Hi., H	1½	2,400	36x3½	36x5	Cont.	4-3½x5	Eise.	none	Pierce	Strom.*	Fuller	Fuller	worm	Timkn.	Ross
Wichita, A	1	1,850	36x3	36x4	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	chain	Shel.	Ross
Wichita, K	1	2,000	36x3	36x4	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	worm	Shel.	Ross
Wichita, L	1½	2,350	36x3½	36x5	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	worm	Shel.	Ross
Wichita, B	2	2,500	36x3½	36x6	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	chain	Shel.	Ross
Wichita, R	2½	2,950	36x4	36x7	Wauk.	4-3½x5½	Bosch	Bosch	Wauk.	Strom.	Hart.	B-Lipe	worm	Shel.	Ross
Wichita, O	3½	3,750	36x5	36x5d	Wauk.	4-4½x5½	Bosch	Bosch	Wauk.	Strom.	Harr,	B-Lipe	worm	Shel.	Ross
Wichita, Q	5	4,600	38x6	38x6d	Wauk.	4-4½x5½	Bosch	Bosch	Wauk.	Strom.	Hart.	B-Lipe	worm	Shel.	Ross
Wilcox, S	1	1,950	35x5*	35x5	Cont.	4-3½x5	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Own
Wilcox, X	1½	2,775	36x4	36x5	Own	4-4½x5	Bosch	none	Pierce	Strom.	Own	Own	worm	Shel.	Own
Wilcox, Q	2½	3,250	36x4	36x3½d	Own	4-4½x5	Bosch	none	Pierce	Strom.	Own	Own	worm	Shel.	Own
Wilcox, P	3½	3,950	36x5	36x5d	Own	4-4½x5	Bosch	.....	Pierce	Strom.	Own	Own	worm	Shel.	Own
Wilcox, W	5	4,850	36x5	40x12	Wauk.	4-4½x6½	Bosch	none	Wauk.	Strom.	B.&B.	Covert	worm	Timkn.	Own
Wilson	1	1,750	35x5*	35x5	Cont.	4 3½x5	Eise.	opt.	Pierce	Marvel	Hart.	Covert	worm	Timku	Own
Wilson	2	2,800	36x4	36x7	Cont.	4 4½x5½	Eise.	opt.	Pierce	Strom.	B.&B.	Warner	worm	Timkn.	Own
Wilson	3½	3,800	36x5	36x5d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Strom.	B.&B.	Warner	worm	Timkn.	Ross
Wilson	5	4,600	36x6	40x6d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Strom.	B.&B.	Fuller	in-g.	Clark	Lavn.
Winther, 39	1½	2,150	34x3½	34x5	Wis.	4-3½x5	Eise.	Bijur*	Simplx.	Strom.	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 49	2	3,000	36x4	36x4d	Wis.	4-4 x6	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 69	3	3,800	36x5	36x5d	Wis.	4-4 x6	Eise.	Bijur*	Simplx.	M st.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 89	4	4,200	36x5	40x5d	Wis.	4-4½x6	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 109	5	5,000	36x6	40x6d	Wis.	4-4½x5½	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 129	6	5,250	36x6	40x12	Wis.	4-5½x6	Eise.	Bijur	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 149	7	5,500	36x6	40x7d	Wis.	4-5½x6	Eise.	.....	.....	Strom.	Fuller	B-Lipe	in-g.	Clark	Lavn.
Winther, 439	1½	2,100	32x4	32x4	Gray	4-3½x5	Eise.	Bijur	.....	Mast.	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 499	3½	4,900	36x5	36x5d	Wis.	4-4½x6	Eise.	none	Wauk.	Mast.	Fuller	Fuller	worm	Shel.	Lavn.
Wisconsin, B	1½	1,750	34x3½	34x4	Wauk.	4-3½x5½	Eise.	none	Wauk.	Mast.	Fuller	Fuller	worm	Shel.	Lavn.
Wisconsin, C	2½	2,850	36x4	36x6	Wauk.	4-4 x5½	Eise.	.....	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Witt-Will, WD-16	1	1,850	36x3*	36x4*	Cont.	4-3½x5½	Eise.	.....	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Witt-Will, WD-18	2½	2,850	36x3½*	36x3½d	Cont.	4-4½x5½	Eise.	.....	.....	Strom.	Fuller	Fuller	in-g.	Russel	Gem.
Wolverine, C	1½	2,250	34x3½	34x5	Cont.	4-3½x5	Split.	G&D*	Mon.						

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; **N.A.**, North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfeld; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chcgo., Chicago-Standard; Cbgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Mitchell Victory Line Shows Refinements

Performance and Production Improved



Although in the main the five- and seven-passenger Mitchell Victory models are very similar, the body effects differ somewhat and the seven uses a longer wheelbase

THE new Mitchell Victory models are fine examples of how engineering refinements of a former design can improve the performance and production of a car without changing greatly its specifications. To one casually familiar with the 1918 Mitchell line the new model is much the same in outward appearance.

Of the four body types in which the new model appears, the five-passenger touring car is typical of the change throughout the entire Mitchell line. The body has a straight-line hood and cowl effect with low bevel-edge sides and, like the three-passenger roadster and the five-passenger sedan, is fitted to a 120-in.-wheelbase chassis. The seven-passenger has a wheelbase 7 in. longer and has a double-cowl type of body. Its engine also is large. A new and better fitting top is used, the leather in the upholstering is heavier, and the radiator is higher.

Engine dimensions are the same as in the previous model, but detail changes have been made to provide better crankshaft balance, better lubrication and to give greater accuracy of production.

Economy of the engine has been greatly improved because of the larger radiator, the passage of water through which is controlled by Rayfield thermostat. This thermostat is made to operate in conjunction with the Rayfield carbureter. The thermostat was designed by Rayfield at the Mitchell factory, so that temperature control would be made to fit in with the rest of the car.

The rear axle is heavier and incorporates the spiral-bevel final drive, a feature adopted during the latter part of last season. The only real change in units is in fitting a Borg & Beck plate clutch in place of the cone used formerly.

The body of the car has undergone a whole series of changes. With the higher radiator, the streamline effect has been carried out to completeness. The keen-looking beveled edge continues from the rear to the front, and around the edge of the cowl it blends into a smooth curve that continues to the front of the radiator.

The front seat has been set back 2 in., which adds to the driving comfort. The gearshift lever has been offset so all gear positions can be reached without shifting one's position in the seat. The instruments on the board are arranged so that they are visible to the driver. The light and ignition switches are controlled with a lever type handle instead of the push button formerly used. The switches are locked with a Yale lock.

The doors of the car are heavier, and the left front door now contains a tool pocket. The steering wheel is set slightly lower and the gears are ball-bearing. This, together with the oversize tires, adds much to the ease of steering. The top is fitted with metal beading and plate glass rear windows.

The frame channel section has been deepened and now measures 6 instead of 4½ in. and is strengthened throughout.

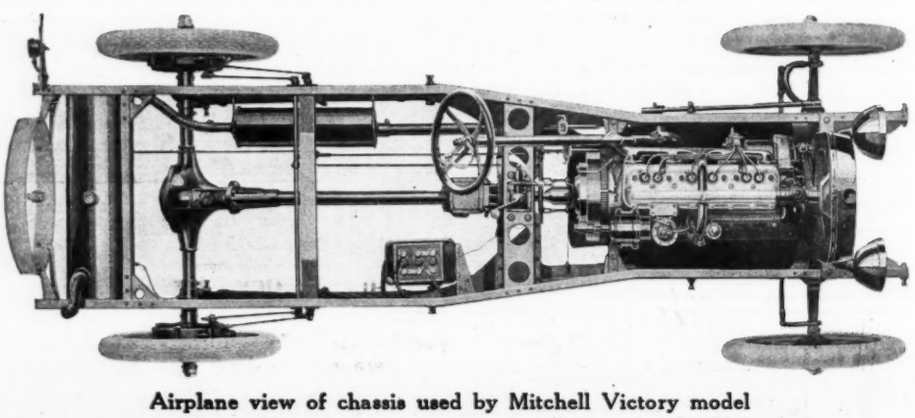
Other improvements on the frame are the tire carrier and the spring-shackle lubricating joints. The tire carrier is a circular band that the rim of the tire fits over. The support is riveted to the frame and held

MODEL E-40 SPECIFICATIONS

Engine—six-cylinder, 3¼ by 5 in. L-head cast in block, with removable cylinder head.
Fuel system—18-gal. tank at rear with Stewart vacuum feed.
Cooling—cellular radiator forced circulation with thermostatic control.
Ignition—Remy automatic from generator and Williard battery.
Steering—worm and full gear adjustable, ball bearing, 18-in. wheel.
Lubrication—force feed and splash system. Oil pump driven from camshaft.
Rear axle—floating with spiral-bevel gears in differential.
Springs—front, half-elliptic; rear, cantilever.
Wheelbase—120 in.
Rims—demountable—one extra.
Tires—34 by 4 on open types; 35 by 4½ on sedan.
Finish—black running gears, fenders, hood and radiator shell; Mitchell green body, cream wheels, nickel trimmings.
Electric system—Remy.
Equipment—dimming reversible headlights, rain-vision ventilating windshield, engine-driven tire pump, engine priming pump, electric horn, speedometer, gasoline gage, spare tire carrier, tools, etc.
Price—five-passenger touring and three-passenger roadster, $1,475; five-passenger sedan, $2,175.

MODEL E-42

Specifications for this model are the same, except the engine is 3½ by 5 and the wheelbase 127 in. The price is $1,675.



Airplane view of chassis used by Mitchell Victory model

at four points so that the possibility of a loose and rattling carrier is reduced. The spring shackles all are lubricated with grease cups, where formerly oilless bushings were used. These cups are conveniently placed and fitted with extensions where necessary so that filling is facilitated.

Detailed refinements brought about by the new manufacturing methods have been made in the engine. The cylinders of the former Mitchell engines were reamed out to 0.001 in., but now with the Government inspection methods being used, the cylinders are ground out to 0.0005.

The crankshaft weight has been increased 35 per cent, the bearings made larger, and the finishing process improved, so that the shaft is now statically and dynamically balanced. A new machine for balancing shafts is used in this connection, together with the old machine, so a double-balancing operation makes sure of the checking process. The lubrication system has come in for its share of improvement. The oil indicator is more easily read, and a dial gives the owner exact information as to the quantity of oil in the engine. The design of the oil sumps has been changed, so in the event of a careless mechanic pouring in too much oil, excessive oiling will not take place. The dash indicator has been changed to a dial recorder, which does not bring oil to the dashboard.

Oil-Tight Joint

The universal joint attached to the driveshaft of the clutch and to the neutral countershaft is inclosed to the degree of oil tightness. This is made possible by the new construction of the driving jaws from the clutch.

The gearbox remains unchanged, except that new standards in testing have been evolved. The exact adjustment of the gears is made possible.

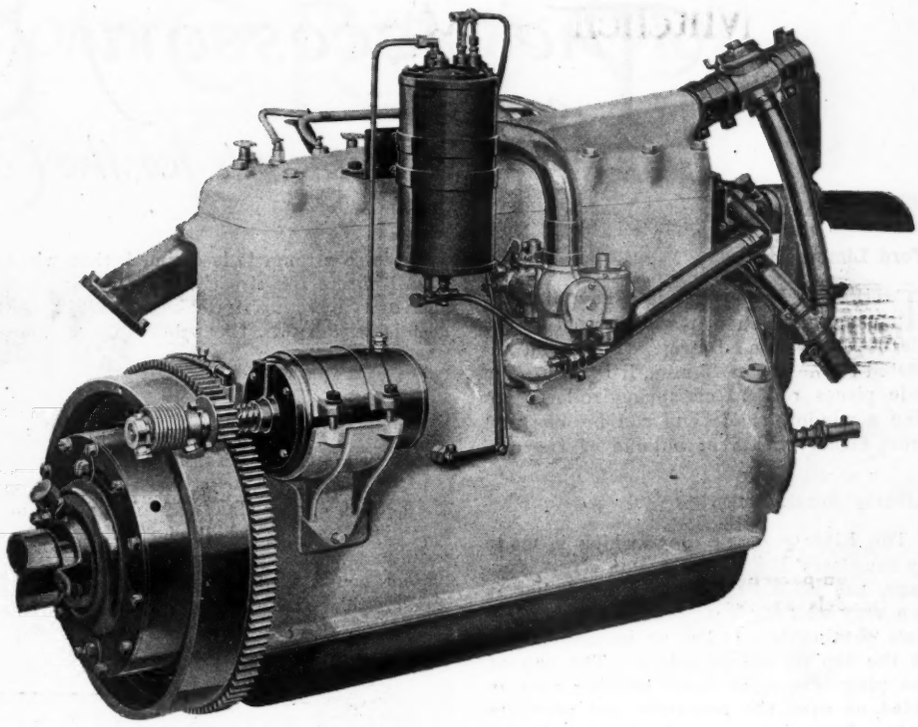
The differential ring gear and pinion construction is new, in that it departs widely from a standard that has become almost universal. The teeth on these gears have a left-hand spiral. Heretofore manufacturers have used right-hand spiral gears, saying that in so doing the natural outward force of the bevel gear was counterbalanced by the inward pull of the spiral. Mitchell uses a left-hand spiral so that the two thrusts add together, and to overcome this extra large bearings are used. The brakes are changed so that the adjustment is now a matter of seconds.

BRANCH FOR DISTEEL WHEEL

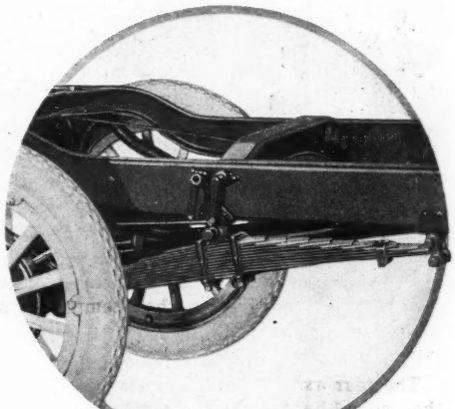
Chicago, April 7—A branch of the Detroit Pressed Steel Co. has been opened in Chicago for Disteel wheels, under the management of LeRoy A. Hillman. Mr. Hillman has been in civilian service with the Bureau of Aircraft production and before that operated the Bearings Shop, interest in which he still retains.

AUTOMATIC IN PRODUCTION

Minneapolis, Minn., April 5—The Automatic Light Co. is just getting into production at the Gile factory at Ludington, Mich. It is understood Gile will discontinue building tractors and devote its attention primarily to the automatic light plant. Up to the present time the company has been able to supply only a few outfits, and these for the most part have gone south or overseas. The company has a connection with the Overseas Engineering Co., New York, and is anticipating a considerable export trade.



The seven-passenger Mitchell Victory model is fitted with an engine of ¼ in. larger bore; otherwise engine details are the same



Cantilever spring used on Mitchell Victory model

NOT THE OLIVER TRACTOR

Chicago, April 7—An interchange of photgraphic film proofs and captions resulted in a wrong label on one of the tractors shown in the story on Southern tractor requirements, March 27. The tractor captioned a close-up of the Oliver tractor was the Holt 5-ton caterpillar and not the Oliver.

MONTHLY TRUCK SPECIFICATIONS

Chicago, April 5—Since the motor truck specification tables which appear in this issue were made ready for the press several changes which it is impossible to incorporate this week have been received. One is a correction on the price of the F-W-D. This is a $4,500 truck and not $4,600. Also the specifications for the new ¾-ton Oldsmobile trucks have been received. They are:

Price, $1,250; tires, 35 by 5 pneumatics; own engine, four-cylinder, 3 1/16 by 5¼; Auto-Lite electric system; Monarch governor; Zenith carbureter; final drive, internal gear; rear axle, Torbensen, and steering gear, Jacox.

SMALL TWIN-CITY SOON

Minneapolis, Minn., April 5—Assembly of the small tractor announced by the Minneapolis Steel & Machinery Co. is to begin in a few days, and the company will be in a position to make deliveries soon.

F-W-D PLANT IN CANADA

Clintonville, Wis., April 7—The establishment of an assembling plant and branch at Kitchener, Canada, has been determined by the Four Wheel Drive Auto Co. The plan involves the organization of a new and distinct corporation with a capital stock of about $200,000, practically all of which will be owned by the stockholders of the present company. While details of the Canadian plant project have not been definitely fixed, it is the intention to erect a large machine shop at Kitchener for the assembling of F-W-D trucks from parts made in Clintonville and shipped into Canada in bulk.

REED WITH SAMSON TRACTOR

Janesville, Wis., April 7—Chester O. Reed, formerly head of the farm mechanics department of the University of Illinois and more recently with the George W. Batten advertising agency of Chicago, has been made advertising manager of the Samson Tractor Co. and Janesville Machine Co., effective April 15.

The Accessory Corner

New Fitments for the Car

Ford Limousette

THE Ford Limousette is a new and unusual attachment manufactured by the Dafoe-Eustice Co., Detroit. It can be adjusted to the car in 45 min., it is said. The side pieces roll up on spring rollers just like a window shade and can be operated from either within or outside of the car.

Liberty Spark Plug

The Liberty spark plug, which is made by the Casey Hudson, 360 Ohio street, Chicago, has no entirely new feature, but it is a very well made plug, of the best materials obtainable. It has an intensifier gap at the top of the porcelain. The cap of the plug is a spun brass bushing that is fitted on over the porcelain and prevents water from being retained around the center electrode. The copper asbestos lined gaskets insure tight joints, and the extra heavy porcelain adds to the plug the quality of durability.

Puncture-Closing Tube

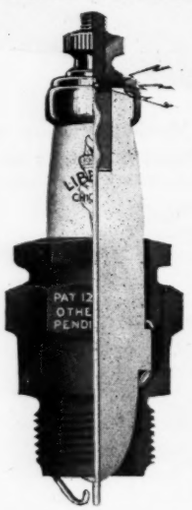
The Shaw Tire Co., Boston, Mass., is making an inner tube for which is claimed puncture-closing properties. The tube is constructed differently from any other tube, in that the tube is molded with numerous cup-shaped cones projecting inwardly. When deflated these cups present a surplus of rubber. But when inflated, this excess of material produces a wedging action that compresses the rubber. This compression force is so strong, it is claimed, that when a nail enters the tire the rubber grips the nail and prevents air leakage. When the nail is withdrawn, the rubber closes upon itself, thus retaining the air.

Safety Oiler

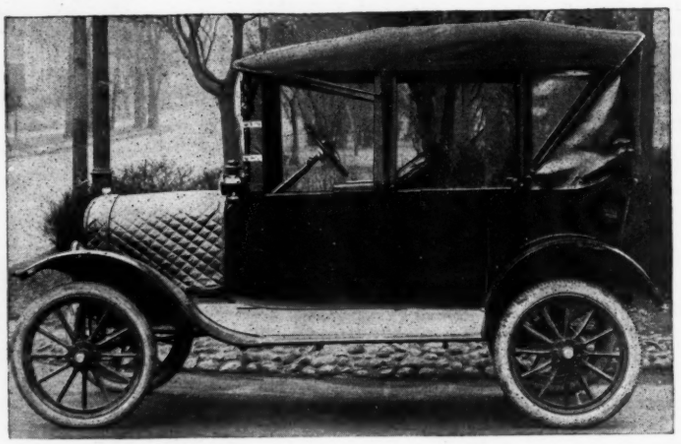
To properly insure the flow of oil in the Ford engine, Charles Kralcek & Co., Cleveland, Ohio, are marketing through the M. & M. Co., Cleveland, an oiling system that gives a supply of oil whose flow can be examined with very little trouble. The system consists of a new cover for the transmission with an oil collector on the inside which takes the oil from the flywheel as it is thrown off. The oil then flows by gravity through an outside pipe to the front of the engine and the timing gears. The device sells for $5.

Maxotires

The Maxotire manufactured by the K. & W. Rubber Co., Delaware, Ohio, is a pressure-supporting inner casing that fits around the inner tube and supports the outward thrust of the tube, transmitting it to the outer casing. It is claimed that a deflated tire cannot bulge at the rim, and thus rim-cut the inner tube and destroy the walls of the casing.



Liberty spark plug



Limousette for Ford cars showing sides rolled up

Tubing and Hose Sizes for Cars

Motor Age Maintenance Data Sheet No. 33

One of a series of weekly pages of information valuable to service man and dealer—Save this page

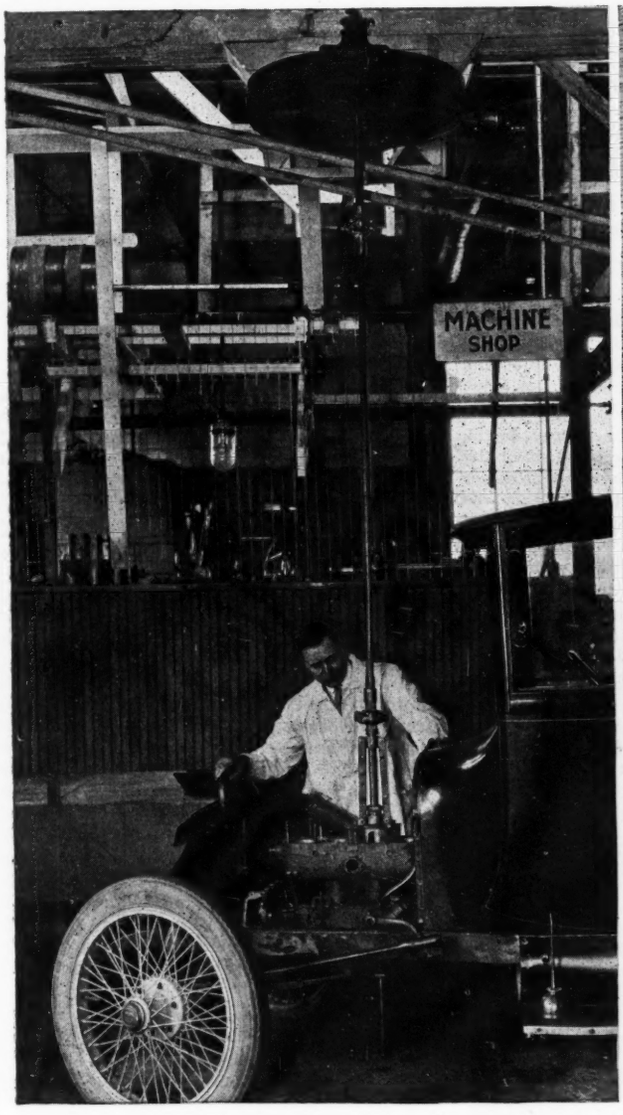
1918 Models

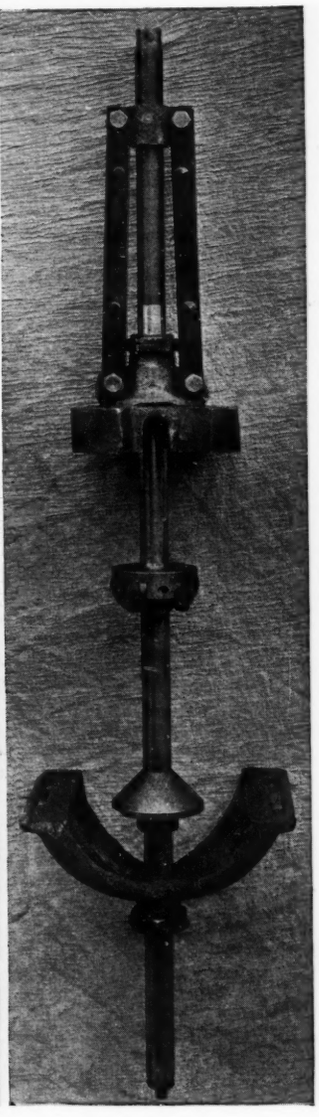
Car and Model—	Gasoline Tubing Diam.	Oil Tube Diam.	HOSE Diameter and Length (Upper)	HOSE Diameter and Length (Lower)
Packard—All	3/8	1/4	1 1/2	1 5/8
Paige—P	5/16	5/16	1 13/16 O	1 5/16 O
Paige—M	5/16	5/16	2 1/16 O	1 9/16 O
Paterson—6-46	1/4	1/4	1 1/4x10 1/2	1 1/4x13
Peerless—56	5/16 & 3/8	5/16	1 1/2x 6	1 3/4x 4
Pierce-Arrow—B-5.	1/2	1/4 & 13/32	2 3/8	1 1/2
Pilot—6-45	5/16	5/16 & 5/16	1 1/2x10	1 x 6 1/2
Premier—6-C	5/16	5/16	1 1/4x10	1 1/2x 4 3/4
Reo—T	1/4	1/4	1	1
Revere	3/8	5/16	1 1/2x 8	1 1/2x 6
Sayers	..	..	.....	.....
Scripps-Booth—G.	5/16	1/4	1 5/8x 5 3/4	1 5/8x 5 & 2 7/8
6-39	1/4	1/4	1 5/8x15	1 3/8x 7 1/2
6-40				
Seneca	1/4	5/16	2 x13 1/2	2 x13 1/2
Standard—G	5/16	1/4	1 1/4x 7 1/2	1 3/4x 7 3/4
Stearns—SKL-4..	5/16	1/4-5/16-1/2	1 3/8x 6	1 3/8x 9
Stearns—SK-8	5/16	1/4-5/16-1/2	2 1/4x10	2 1/4x10

Car and Model—	Gasoline Tubing Diam.	Oil Tube Diam.	HOSE Diameter and Length (Upper)	HOSE Diameter and Length (Lower)
Stephens—70 & 75.	5/16	3/8	2 1/4x11 3/4	2 1/4x17 1/2
Studebaker—SH..	1/4	3/16	1 7/8x10 1/2	1 1/2x 2 3/4
Studebaker—EG..	1/4	3/16	1 7/8x 9 1/2	1 1/2x 5 1/2
Studebaker—EH..	1/4	3/16	1 7/8x10 1/2	1 7/8x 8 3/4
Stutz—S	3/8	3/8	2 1/4	1 1/2
Templar—All	5/16	3/8 & 1/4	1 1/2x 9 1/4	1 1/4x 7 3/4
Tulsa—D1	5/16	5/16	2 1/4x10	2 1/4x14 1/2
Velie—37	5/16	1/4	1 1/2x 9 3/4	1 1/4x 9
Velie—38	5/16	1/4	1 1/4x 9 1/2	1 1/4x10 3/4
Westcott—S-18...	5/16	1/4	1 1/2x 7 1/2	2—1 1/4x 3 1—1 1/4x13
Westcott—S-18A..	5/16	1/4	1 1/2x 7 1/2	2—1 1/4x 3 1—1 1/4x11
Winton—22	1/4	..	1 1/2x 7	1 1/4x25 3/4
Winton—22A	1/4	..	1 1/2x 6	1 1/4x24
Willys-Knight—				
88-4	1/4 & 5/16	1/4 & 3/8	2 3/4x 3 3/4	2 3/4x 5 1/8
88-8	5/16 & 3/8	1/4	2 x 5 5/8	2 x 7

The Motor Car Repair Shop

Practical Maintenance Hints





Boring Machine

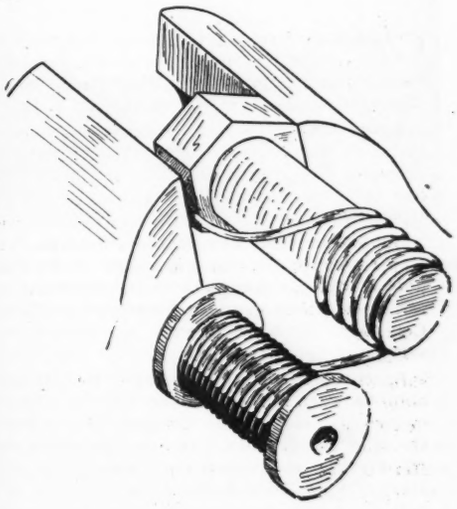
A NOVEL boring machine made by an enterprising Dodge Brothers dealer, Schlecht Motor Sales Co., Memphis, Tenn., is shown. This system has several advantages. The engine need not be removed from the car, and there is an adjustable bearing at the upper and lower ends of the bar. The boring head has six cutters and are so arranged that the depth of the cut can be varied by turning the hexagon nut at the bottom of the bar.

For Detachable Heads

There is a disadvantage in this boring machine in that only engines with detachable-cylinder heads can be rebored with it. For these engines, though, the machine is very good, and it seems that any service station with some machinery could make one somewhat similar. This one was made from two propeller shafts and two universal joints. The other parts were made on the lathe and the anvil, except the two castings.

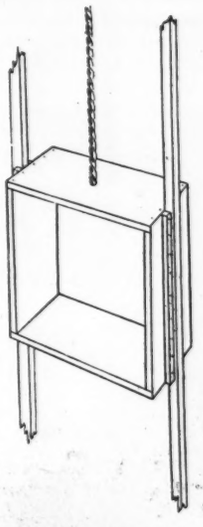
Size of New Piston

If a set of inside and outside micrometers are not available and the repairman is in doubt as to whether the new piston is too tight a fit in the cylinder, the next nearest accurate operation is this. Place the piston in a rather slow-heating fire and let it come to heat of about 600 deg. Fahr. While it is in this condition, place it in the cylinder and work it up and down. If the piston works freely, it is evident there will be little danger of its sticking in the cylinder from heat expansion. While this cannot be as accurate it will serve.



Keep Spring Wire

Small springs such as are used on emergency brake levers, idler adjustments for silent chains, or brake bands frequently have to be renewed. The problem of finding a spring of the required size is lessened if the spring wire is kept on hand, for then the spring can be made by winding the wire around a bolt. After removing from the bolt the spring is stretched to the proper length. The method of holding the bolt and winding the wire is shown.



Dumbwaiter

Even a home-made dumbwaiter will save many steps and much time where the stockroom is on one floor and the shop on another, and in some cases it may even permit the elimination of a man. This dumbwaiter consists of a box which runs on two vertical wooden rails. It is suitable for carrying all sorts of small goods and papers. To reduce the physical effort it is desirable to balance the weight of the box with a counterweight.

Among the Makers and Dealers

Short Trade Notes

GREEN to Represent Grinder Concern—H. M. Green has been appointed Pennsylvania representative of the Precision & Thread Grinder Mfg. Co., Philadelphia, Pa.

Babcock with Rubber Products—Edward S. Babcock, who recently resigned as advertising manager of the Firestone Tire & Rubber Co., has been made general sales manager of the Rubber Products Co., Barberton, Ohio.

Duplex Appoints Zone Representatives—The Duplex Truck Co. has appointed H. P. Baer and L. W. Brownrigg zone representatives. Mr. Baer came to Duplex from the Vim Truck Co. Mr. Brownrigg was in Government service.

Parts Company is Changed—The partnership between H. Greenberg and H. Hersch doing business as the Progress Auto Parts Co., Cleveland, Ohio, has been dissolved and H. Hersch continues the concern as the Hersch Auto Sales & Parts Co.

National Tractor Building in Iowa—The National Tractor Co. will start construction work at once on a storage and paint building to cost $26,000. The new building will be one story 120 by 160 ft. Cedar Rapids, Iowa, will be the western distributing point for the National and when the new building is completed ten tractors will be turned out a day.

Atlanta Dealer for Hanson—One of the recent transactions on Atlanta's row was the deal George Hanson, president of the Hanson Motor Co., announced whereby the Charles W. Tway company becomes distributor for Atlanta and vicinity of the Atlanta-built Hanson six. This car has had considerable sale in the South, and the institution backing it is owned and operated by southern business men. Specifications of this car include in part such standard units as the Continental engine, Timken axles, Long radiator, Covert transmission, etc. The Hanson factory is at Oakland City, near Atlanta, and production this year, it is said, will exceed 2000 cars.

Peterson Heads Cincinnati Goodyear—W. J. Peterson, formerly service manager of the Philadelphia branch of the Goodyear Tire & Rubber Co., is the new manager of the Goodyear branch in Cincinnati, Ohio.

Craig is Janesville Trade Manager—Hugh M. Craig, who has been with the Janesville Machine Co. for many years, has been made trade manager and will have entire charge of domestic sales.

Place Becomes Duplex Superintendent—Allan S. Place, formerly with the Chevrolet Motor Co., Flint, Mich., has just assumed the superintendency of the Duplex Truck Co., Lansing, Mich.

Niblette to Supervise Tire Sales—H. B. Niblette has been appointed supervisor of the tire sales division of the Thermoid Rubber Co., Trenton, N. J. Mr. Niblette formerly was with the B. F. Goodrich Co. and, more recently, the Quaker City Rubber Co.

Mason Leaves Goodrich Branch—W. H. Mason, manager of the Milwaukee, Wis., branch of the B. F. Goodrich Rubber Co., resigned March 15 to become associated in an executive capacity with the J. R. Petley Co., distributer of Diamond tires and other rubber products. A. G. Underwood, Seattle, Wash., succeeds him as manager of the branch.

Wilson Addition Ready Soon—The new press and die department of the C. R. Wilson Body Co. will be completed within sixty days. This will add 200,000 sq. ft. to the company's plants. The general offices and engineering department will be moved to the sixth floor of this new building, which contains 35,000 sq. ft. and comprises among other features a directors' room and office and factory conference rooms. These additional facilities will enable the company to produce more than 1000 bodies a day.

Union Switch to Finish Crankshafts—The Union Switch & Signal Co., Swissvale, Pa., has purchased machinery for finishing crankshafts and camshafts and expects to be ready to make deliveries about June 1. The company manufactures its own forgings.

Bloom with Essenkay Products—S. Bloom has been appointed director of advertising of the Essenkay Products Co. Mr. Bloom has been in Government service for the last year but will assume his new duties at the plant and general offices in Chicago immediately.

Greenhoe with Hyatt at Detroit—Claude Greenhoe has been made chief engineer of the Detroit plant of the Hyatt Roller Bearing Co. He comes to Detroit from the Militor Corp., Newark, N. J. Prior to that he was with the Republic Motor Truck Co., King Motor Car Co. and American Gear & Mfg. Co.

Moorman is Trailer Sales Manager—E. L. Moorman, Beloit, Wis., has accepted the position of manager of the sales department of the Highway Trailer Co., Edgerton, Wis., and assumed his new duties March 15. Mr. Moorman has been sales manager of the Beloit Gas & Electric Co. for many years.

Traffic Truck Gets More Room—The Traffic Motor Truck Corp., St. Louis, Mo., has moved from its original factory to another, where it will have more than 100,000 sq. ft. of factory space. This is carrying out a plan for greater volume of production and for a greater manufacture of the parts used in the truck.

Calder Heads Anderson Tire—John Calder has been elected president and general manager of the Anderson Tire Mfg. Co., Washington. Mr. Calder was formerly factory manager of the Cadillac Motor Car Co. The Anderson company plans to erect a plant in the Middle West to produce 1000 truck tires a day.

New Stewart Truck Dealer—The Parsons Motor Corp., southeastern distributer of the Stewart truck, recently closed a deal whereby the Southern States Electric Co., Birmingham, Ala., becomes the northern Alabama representative of the Stewart. The latter concern has just recently acquired the agency in this territory for the Cleveland tractor also.

Accessory Concern Loses by Fire—Fire destroyed the warehouse and office building, including stocks, of the Arkansas Automobile Appliance Co., Little Rock, Ark., recently, the loss approximating $160,000. Business will be continued in a temporary location, however. The concern, popularly known as the 3A Co., is one of the largest wholesale distributers of automotive supplies and equipment in the South.

Stegeman is Reliance Chief Engineer—The Reliance Motor Truck Co., Appleton, Wis., has perfected the organization of its engineering and production staff. Beginning with the delivery of its first motor truck, the company is now on a regular production basis of one chassis a day. Oscar Stegeman is now chief engineer. H. F. Vahl is the new production manager. Mr. Stegeman formerly was president and general manager of the Stegeman Motor Car Co., now the Parker Motor Truck

ESSEX SHOWS A TASTE FOR LEARNING—The Essex is shown here trying to enter Notre Dame University, as it were. The stunt was staged by D. A. Boswell, manager of the Superior Motor Sales Co., South Bend, Ind., to demonstrate the car's powerplant

Co. The present output of Reliance trucks is confined to a 1½-ton model, but after July 1 a new 2½-ton design is expected and later a 3½-ton.

Cadillac to Have Downtown Office—Plans for a downtown office, service and retail building in Detroit for the Cadillac Motor Car Co. and other General Motors concerns is to be built soon at a cost of $3,000,000.

Goodrich Conducts Tire School—The service department of the B. F. Goodrich Rubber Co. is conducting a free tire school. Many garage and vulcanizing men are attending. The course consists of lectures and practical work at the bench in the latest methods for the repair of cord and fabric tires.

American Pressed Radiator Elects—The American Pressed Radiator Corp., Detroit, has elected the following officers: President, C. H. O. Meyer; vice-president, R. S. Drummond; secretary, John S. Irwin; treasurer, H. F. Hiney. Mr. Drummond was formerly vice-president and general manager of the Detroit Steel Products Co., and Mr. Hiney was associated with him at that plant.

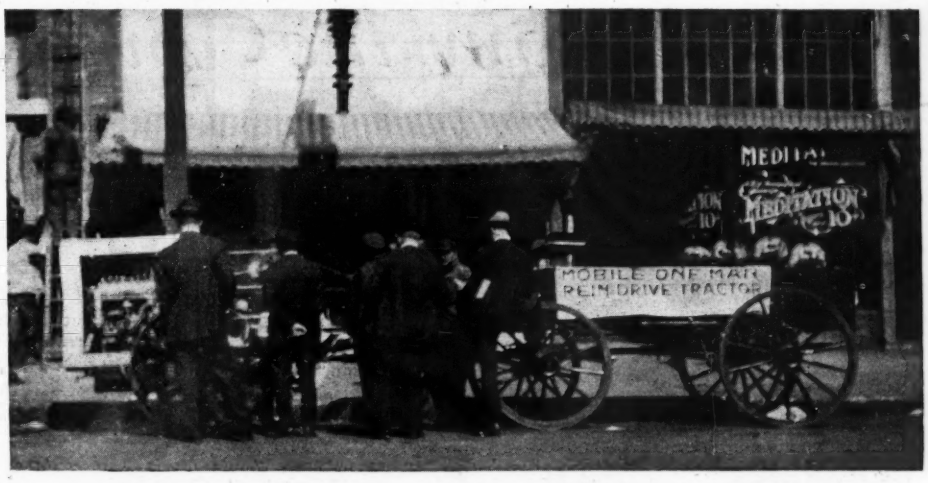
Service Putting Up Administration Building—An administration building to contain all the offices of the company and to provide facilities for conventions and welfare work is being erected by the Service Motor Truck Co., Wabash, Ind. The building, which will be three stories, 130 by 50 ft., fireproof and of concrete and brick, will cost about $100,000. The company expects to occupy it in July.

Bohnet & Co. to Expand Plant—John Bohnet & Co., Lansing, Mich., have increased their capitalization from $10,000 to $75,000 and will enter the commercial body field. They expect to be in production within sixty days. The present factory building, which has 60,000 sq. ft. of floor space, will be altered to accommodate the new department. W. G. Suprenant has been placed in charge of the body work.

New Overland Building Dedicated—The Galesburg, Ill., Overland Co., dedicated a new building recently and Illinois Overland dealers and factory representatives assisted. The firm was organized ten years ago by Fred Peterson and Arthur Miller and has grown to be one of the leading branches of the Middle West. Vice-President E. B. Jackson of Overland delivered the principal address at the banquet.

Hayes to Make Truck Wheels—The Hayes Wheel Co., which has made wooden wheels for cars ever since the industry was established, is launching into the business of supplying wheels for trucks and tractors and has established a new branch in the plant of the Jackson Munition Corp., which it has leased and probably will purchase. As fast as machinery used for munitions work is removed machinery for making steel wheels and metal parts is being installed.

Released Officers with Standard Parts—Several officers who left their positions with the Standard Parts Co. to go into Government service have returned to their pre-war work. Other officers identified with the engineering division of the Motor Transport Corps also have been added to the staff. Capt. E. R. Finkenstaedt, active in the production of the Liberty truck for the Government at Washington, has resumed his duties as assistant to President Christian Girl. Maj. Lewis P. Kalb, until recently in charge of designing, testing and specification work in the engineering division of the Motor Transport Corps, has become assistant director of engineering and Capt. A. L. Watts, in charge of the specification and record section of the engineering division of the Motor Transport Corps, has joined the engineering staff. Both Lieut. Rex Gosling, who before entering service was purchasing agent of the Standard Welding division, and Lieut. Ray Jones, who gave up his position as production manager of the Perfection Spring division to enlist in the Navy, have returned to their respective plants.



REIN DRIVE TRACTOR IN BIRMINGHAM—These men are looking at the Mobile rein-drive tractor as it is demonstrated on the streets of Birmingham, Ala. This tractor is called the Automotive in other sections of the country

Briscoe Opens Export Offices—The Briscoe Motor Corp., Jackson, Mich., has opened export offices in New York. C. L. Thurston, export manager, is in charge.

Two Cars Plus Two Trucks—The Kean-Myers Motor Sales Co. has been appointed distributer for the Haynes and Columbia cars and Wolverine and Union trucks, Louisville, Ky.

Spencer-Carroll Moves to Dallas—The Spencer-Carroll Co. has moved from Waco to Dallas, Tex., and will operate its wholesale business in automotive equipment from that center.

Sproat Is New Way Secretary—Harry J. Sproat has been made secretary and factory manager of the New Way Motor Co., Lansing, Mich. He was formerly factory manager for the Olds Motor Works.

King Leaves Hyatt Company—R. B. King, assistant works manager for Hyatt Roller Bearing Co., Newark, N. J., has resigned. He was with the Hyatt company eight years. His future plans are not given out.

General Motors Declares Dividend—General Motors has declared a regular quarterly dividend, 3 per cent on common, 1½ per cent on preferred and debenture stocks, all payable May 1 to stockholders of record April 15.

Arrow-Grip Enlarges—The Arrow-Grip Mfg. Co. has increased its capital stock from $100,000 to $500,000, and will erect a new factory building soon in which chains, jacks and other accessories will be made. It also has opened an export office in New York.

Neely Is Barley Assistant S. M.—Jack Neely, formerly with the sales department of the Roamer distributing agency at Kansas City, has been made assistant sales manager of the Barley Motor Car Co., Kalamazoo, Mich., maker of the Roamer car.

Dawson with Gary Truck—Frank Dawson, who has been identified with the truck industry for the last fourteen years, has resigned as designing engineer and production manager of the Master Truck Co., Chicago, to become general manager in charge of production for the Gary Motor Truck Co., Gary, Ind.

Hutchins Becomes Service Supervisor—Thomas R. Hutchins, Quincy, Ill., who has been president of the Quincy Auto Trade Association, has resigned to become service supervisor for Willys-Overland, with headquarters in St. Louis. For several years he has been service manager for the Overland at Quincy. In his new post he will be required to install with each distributer in the St. Louis territory a new system of accounting and service methods.

Russell Heads Packard Branch—P. S. Russell, formerly general sales manager for Hale & Kilbourne, Philadelphia, Pa., but more recently with the Army, has been appointed manager of the new Packard branch at St. Louis, Mo.

Cooper Takes on U. S. Truck—The Cooper Motor Co. has been appointed distributer in the Southwest for the United States Motor Truck Co. The Cooper company has branches in Kansas City, Mo.; Omaha, Neb.; Wichita, Kan., and Tulsa, Okla.

To Sell Tractors for General Motors—E. B. Moore and Clyde J. Jacoby, Marshall, Mich., have been engaged to assume management of the sales department of the tractor division of the General Motors Corp. Mr. Moore is a member of the Michigan farm bureau.

Duplex Truck Increases Production—The Duplex Truck Co., Lansing, Mich., has increased its production 25 per cent in the last three months, having completed its return from war to peace work without difficulty. The company is conducting an extensive sales campaign and now has seventy active distributing agencies in various parts of the country.

Chair Factory Becomes Body Plant—The Ramsey-Alton Mfg. Co., Portland, Mich., which was a chair factory before the war, wagon parts plant during the war, is going to engage in the manufacture of bodies for trucks. The concern has several hundred thousand dollars' worth of material on hand and most of this can be worked up into truck bodies, company officials believe.

Service Flag of Business—During the war when several of the force of the Waterhouse-Sands Co., Seattle, Wash., entered the service of the country P. E. Sands, the manager, sent them away with an encouraging word: "Come back when your Government job is finished—there's one waiting for you here." Ten of the boys have returned so far, and more are expected. A service flag of business is being placed in the big salesrooms.

Growth of Western Dealer—The Shields-Livengood Motor Co., Seattle, Wash., which had for its original place of business an old church at Yakima, Wash., and occupied 1200 sq. ft. of floor space to-day occupies two large buildings which house the National and Lexington lines, one in Yakima recently completed at a cost of $70,000, covering in all 25,600 sq. ft. of floor space. The Seattle house covers in all 38,400 sq. ft. of floor space.

From the Four Winds

Glimpses at the World of Motordom

WHEN GERMANY RETREATED—This shows a truck loaded with guns being conveyed to the rear when the German army retreated after the armistice was signed

INDIANA Starts Show Building—The Indiana board of agriculture has instructed architects to prepare drawings for the new display buildings to be erected on the state fairgrounds and in which all future motor shows will be held in Indianapolis. The recent general assembly appropriated money for such a building. The exhibit space will cover 2 acres. The building will be 250 by 320 ft.

New Highway for Canada—A bill of interest to the motorists of Canada and the United States will be introduced at the present session of the Dominion parliament, asking an appropriation of $10,000,000 to build a road to be known as the Canadian highway across Canada from coast to coast. This project is in addition to the road-building program which will open vast new areas in northern Ontario, the Peace River country and Central British Columbia to settlement and rapid development through immigration. The Canadian highway, according to plans mapped out two years ago by the Canadian Automobile Association, will extend from Glace Bay near Sydney, N. S., to Cape Scott on Vancouver Island. From the Nova Scotia coast it will run to Moncton, N. B., west along the southern bank of the St. Lawrence to Quebec and then on as direct a line as possible through Ottawa to Winnipeg. West of Winnipeg good highways already exist connecting Winnipeg, Portage la Prairie, Brandon, Regina, Moose Jaw, Swift Current, Medicine Hat and Calgary. The joining of these links will not be difficult or expensive. West of Calgary the highway through the mountains to the Pacific has been completed except for about 150 miles. If the $10,000,000 appropriation is made by parliament the money will be distributed among the provinces according to mileage and a proportionate amount will be allotted for road-building to Prince Edward Island and Yukon territory, which are off the main route. One of the provisions of the bill is that none of the money shall be used to purchase rights of way and no bridge on the highway shall cost more than $5,000. The Canadian highway will connect at Quebec with the new Atlantic highway from Miami, Fla., and at Winnipeg with the Jefferson highway from New Orleans.

Milwaukee Judge Serves Notice—Judge August C. Backus of the municipal court at Milwaukee, Wis., whose drastic dealing with motor car thieves has attracted the attention of many motor and insurance men, has announced from the bench that henceforth no more probationary sentences will be meted out to offenders of this class. The warning came while Judge Backus sentenced two boys to serve one year each in the state reformatory for stealing a car for a joy ride and then abandoning the machine in a badly damaged condition.

Invent Demountable Tire Rim—Paul Jacobs and George W. Hogben, Houghton, Mich., have invented and patented a demountable tire rim which can be adjusted in 4 minutes, it is said. The attaching feature consists of four or more bolts and lugs attached directly to the felloe of the wheel. The lugs project above the periphery of the felloe to engage a groove in the rim itself. The bolts are released by a few turns, and there are no nuts to be removed. No part of the rim leaves the wheel when the tire is exchanged and it is this feature the inventors claim will win favor for it.

Record Rubber Shipment—One of the largest shipments of rubber ever dispatched in a single lot is proceeding across country from San Francisco to Detroit in a special train of twenty-six cars. The weight of the shipment is 2,240,000 lb. The rubber is consigned to the Morgan & Wright tire plant of the United States Rubber Co. It arrived at San Francisco from Singapore on the Siberia Maru March 1 and represents part of the large accumulations of crude rubber held back in the far east by the embargo on importations. The shipment in question represents the entire production of about 560,000 rubber trees for an entire year and the labor of more than 1000 men for the same period.

Insurance Projects Looked Into—Seven men have been indicted in Cincinnati, Ohio, charged with representing to car owners that they were selling insurance when as a matter of fact, while their contract has the official look of an insurance policy, it was merely the contract for legal work and the privilege of buying tires and other supplies at an indefinite discount. Following the indictments, associations of various kinds are being investigated through the Cleveland Automobile Club and affiliated organizations in other cities. At a recent meeting of the trustees of the Ohio State Automobile Association reports were received from many cities that similar schemes were being worked. A resolution was adopted by the representatives of the various clubs to investigate the situation and, in addition to warning the club members, seek to have the operators stopped.

Coming Motor Events

SHOWS

Brooklyn, N. Y.	Motor Vehicle Dealers' Association	April 5-12
Montreal, Canada	Soldiers' Wives' League	April 5-12
Deadwood, S. D.	Deadwood Business Club	April 8-12
Waynesburg, Pa.	Automobile Dealers' Association	April 16-19
Albany, Ala.		April 16-19
Bristol, Va.		May 10-17

MEETINGS

Hot Springs, Va.	Automotive Equipment Association	June 2-6

RACES

Indianapolis, Ind.	May 31
Cincinnati, Ohio	July 5
Uniontown, Pa.	July 19
New York	July 26
Elgin, Ill.	Aug. 22-23
New York	Aug. 23
Uniontown, Pa.	Sept. 1
New York	Sept. 20
Cincinnati, Ohio	Oct. 1